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Ground Cloud Dispersion Measurements During The Titan IV Mission #K21 (6 November 1995) at Cape Canaveral Air Station

21 June 1996

Assembled by

Environmental Systems Directorate
Systems Engineering
Space Launch Operations

Prepared for

Launch Programs
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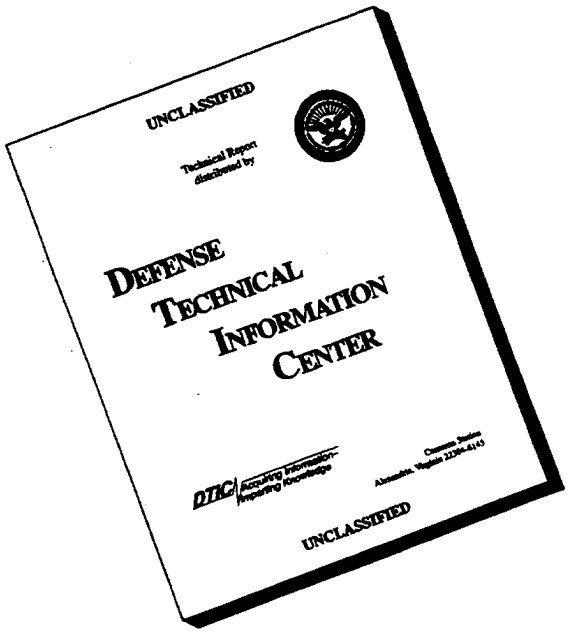

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R. Reiners, Maj, USAF
SMC/CLN

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13. ABSTRACT (*Maximum 200 words*)

Launch cloud imagery, ground-level HCl measurements, and meteorological data recorded during the 00:15 EST launch of a Titan IV vehicle at Cape Canaveral Air Station (CCAS) on 6 November 1995 (mission #K21) are presented. These data will be used to determine how accurately the Rocket Exhaust Effluent Diffusion Model (REEDM) can predict toxic hazard launch corridors. Infrared imagery showed that the ground cloud stabilized at a height of 1375 m at T + 4 to 5 min. REEDM predicted a stabilization height of 1131 m and a T + 7.7 minute stabilization time based on T – 0.7 hour rawinsonde data. The stabilization height predicted by REEDM is in closer agreement with the value determined by imagery for this launch than for launches #K19 and #K23 where the ground clouds were found to stabilize at heights twice those predicted by REEDM. The imagery data show that the ground cloud rose and spread with minimal east/west transport for the first 10 min following launch.

Ground-level HCl measurements made by dosimeters placed on the pad's lightning towers and perimeter fence show that the majority of the ground-level HCl moved northwest and south-southwest of the launch pad, consistent with the imagery data.

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Preface

The Air Force Space and Missile Systems Center's Launch Programs organization (SMC/CL) is sponsoring the Atmospheric Dispersion Model Validation Program (MVP). This program will evaluate the accuracy of atmospheric dispersion models such as REEDM in predicting toxic hazard corridors at the launch ranges. This report presents the MVP launch cloud dispersion and meteorological measurements performed during the Titan IV #K21 mission at CCAS on 6 November 1995.

An MVP Integrated Product Team (IPT) has been directing the MVP effort. The IPT was led by Lt J. Schorie (SMC/MEEM) and Lt L. Garcia (SMC/MEER) during a period that included the #K21 mission. H. Lundblad of The Aerospace Corporation's Environmental Systems Directorate (ESD) is the IPT's technical manager. G. Loper of The Aerospace Corporation's Lasers and Optical Physics Department and H. Lundblad coordinated the preparation of this report from material contributed by personnel participating in the launch cloud dispersion measurements during the #K21 mission.

Infrared imagery measurements were made on the launch cloud by B. Kasper, G. Scherer, and J. Valero of The Aerospace Corporation's Environmental Monitoring and Technology Department (EMTD) and J. Ligda and D. Schulthess of Aerospace's Eastern Range Systems Engineering Directorate (ERD) in order to monitor the cloud's growth, stabilization, and trajectory. D. Schulthess coordinated site selection and logistical support with appropriate Range organizations. K. Foster (EMTD) digitized the imagery data for analyses by R. Abernathy. R. Abernathy, B. Kasper, and R. Heidner (EMTD) prepared the report's description of the cloud imagery results.

The ground-level HCl measurement effort was managed by Capt P. Devane of 45th Medical Group Bioenvironmental Engineering Services (45 AMDS/SGPB). The ground-level HCl measurement effort was coordinated by MSgt S. Zeigler of SGPB and D. Schulthess of Aerospace's ERD under the direction of Capt Devane. SGPB and NASA Toxic Vapor Detection Laboratory (TVDL) personnel deployed and analyzed the HCl dosimeters, respectively. SGPB personnel participating in the effort included: TSgt M. Forcier, Sgt E. Everhart, SSgt J. Patrick, Sgt R. Rivera, Amn R. Voight, and Amn M. Barker. Capt Devane coordinated risk assessment predictions with 45 SW/SES from the Range Control Center Bioenvironmental Engineering Services console. Capt Devane relayed launch cloud dispersion model predictions to supporting SGPB and TVDL personnel for optimum sensor deployment prior to launch. NASA TVDL personnel who participated in the effort included D. Lueck (NASA), and from INET T. Hammond, P. Yocom, D. Curran, B. Meneghelli, M. Springer, T. Hodge, and C. Fogarty. This report includes a summary of ground-level HCl measurement results provided by P. Yocom and D. Curran.

R. Evans of Ensco, Inc.'s Applied Meteorology Unit provided rawinsonde data collected at various times before launch. S. Cobb and J. Kamada of Aerospace ESD tabulated these data for use in this report. R. Abernathy (EMTD) ran REEDM to obtain the predicted cloud stabilization height and ground-level HCl concentrations presented here.

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Executive Summary

This report summarizes the results of infrared imagery measurements of the exhaust cloud produced during the Titan IV #K21 launch from CCAS's Space Launch Complex-40 (SLC-40) on 6 November 1995 at 00:15 EST (05:15 Zulu time). The report also presents ground-level HCl measurements and rawinsonde data determined at CCAS during mission #K21. These data and similar results from future launches will be used with data from aircraft-based HCl sampling and tracer gas releases to determine the accuracy of atmospheric dispersion models such as Rocket Exhaust Effluent Diffusion Model (REEDM) in predicting toxic hazard corridors (THCs) at CCAS and Vandenberg Air Force Base. The THCs assess the risk of exposing the public to HCl exhaust from vehicles using solid propellants or to the accidental release of hydrazine-fuel or nitrogen-tetroxide oxidizer vapors during launch operations.

Personnel from The Aerospace Corporation employed the Titan IV dedicated Visible and Infrared Imaging System (VIRIS) to record infrared imagery data on the Titan IV vehicle's ground cloud from two sites as a function of time following launch (an infrared imager located at a third site malfunctioned). This was the first deployment of VIRIS for a night launch. Analysis of the first 10 min of the imagery data provided the rise time and stabilization height of the ground cloud. The cloud's three-dimensional size, ground track, and speed could not be accurately determined due to low wind speeds and the use of only two imagery sites. The imagery data collected from the two sites showed that the ground cloud stabilized at a height of 1375 m at T + 4 to 5 minutes. Using T – 0.7 hour rawinsonde data, REEDM predicted a stabilization height of 1131 m and a T + 7.7 min stabilization time. The stabilization heights predicted by REEDM and determined by imagery are in closer agreement for this launch than for the #K19 and #K23 launches where the ground clouds were found to stabilize at heights twice those predicted by REEDM. Nonetheless, the rawinsonde-determined wind direction (289° at 1375 m) was 195° out of phase with REEDM's predicted trajectory (94° at 1131 m) due to wind direction changes between these altitudes. Better stabilization altitude estimation by REEDM would provide improved predictions of cloud trajectories since the wind direction at the proper stabilization height would be used. The imagery data showed that the ground cloud rose and spread with minimal east/west movement during the first 10 min following launch due to low wind speeds near the surface.

Personnel from the 45th Medical Group Bioenvironmental Engineering (45 AMDS/SGPB) and NASA's Toxic Vapor Detection Laboratory (NASA TVDL) deployed dosimeters around the launch facility to determine ground-level HCl doses. Dosimeters placed on lightning towers 45 m away from the pad to the northeast, southwest, and northwest registered saturated HCl responses (>380 ppm-min) while no HCl exposure was measured by the dosimeter on the lightning tower southeast of the pad. No HCl exposures were measured by dosimeters placed on the perimeter fence 180 m away from the pad except at locations northwest and south-southwest of the pad where low-exposure doses (1.36 and 1.52 ppm-min) were measured. These results show that the ground-level HCl primarily moved northwest and south-southwest of the launch tower consistent with the imagery data.

1. Introduction

There is a strong need to collect data that can be used to validate the performance of atmospheric dispersion and chemical kinetic models that are currently used or under development for predicting the transport and fate of hazardous species that may be released into the atmosphere during Air Force launch vehicle operations. Launch vehicles that employ solid propellant rocket motors release ground clouds into the Eastern Range and Western Range launch areas at Cape Canaveral Air Station (CCAS) and Vandenberg Air Force Base (VAFB), respectively, that contain large amounts of hydrogen chloride (HCl). Large quantities of hazardous hydrazine fuels or the oxidizer nitrogen tetroxide could also be accidentally released at the ranges during propellant transfer operations or due to a launch vehicle explosion.

The Air Force launch range safety organizations of the 45th Space Wing at Patrick Air Force Base (45 SPW/SE) and 30th Space Wing at VAFB (30 SPW/SE) are respectively responsible for assuring that Eastern and Western Range launches are carried out only when meteorological conditions are such that personnel in communities nearby CCAS and VAFB cannot be exposed to hazardous levels of HCl, the hydrazine fuels, or N_2O_4/NO_2. Predictions of toxic hazard corridors (THCs) that extend into public areas can lead to costly launch delays. The present use of non-validated models requires the use of conservative launch criteria. The development and validation of accurate atmospheric dispersion models are expected to increase launch opportunities and significantly reduce launch costs. The Space and Missile Systems Center's Titan System Program Office (SMC/ME), now merged into Launch Programs (SMC/CL), thus established the Atmospheric Dispersion Model Validation Program (MVP). MVP is collecting data to determine the accuracy of current and future atmospheric dispersion and chemical kinetic models in predicting THCs during launches of Titan and other vehicles at CCAS and VAFB.

The MVP effort involves the collection of data during Titan launches at CCAS and VAFB to characterize HCl launch cloud rise, growth, and stabilization as well as launch cloud transport and diffusion. These data, as well as data from tracer gas releases, will be used to determine the capability of the Rocket Exhaust Effluent Diffusion Model (REEDM) for predicting THCs at the launch ranges. REEDM (see Appendix A) is used at CCAS and VAFB to predict the locations of THCs in support of launch operations. It is applied to large heated sources of toxic air emissions such as nominal launches, catastrophic failure fireballs, and inadvertent ignitions of solid rocket motors. It uses launch vehicle and meteorological data to generate ground-level concentration isopleths of HCl, hydrazine fuels, NO_2, and other toxic launch emissions. Launch holds may occur when REEDM toxic concentration predictions exceed adopted exposure standards. REEDM is a unique and complex model based on relatively simple modeling physics. It has a long developmental history with the Air Force and NASA, but has never been fully validated. A recent change in toxic exposure standards adopted by the range safety offices has resulted in longer REEDM THCs and a higher potential for launch holds. As a result, validation of REEDM has been identified as a range safety priority.

The MVP has been organized and is being directed by the MVP Integrated Product Team (IPT). SMC/CL is serving as the IPT leader while the Aerospace Corporation's Environmental Systems Directorate is the IPT technical manager. The IPT consists of personnel with expertise in atmospheric dispersion modeling, meteorology, and atmospheric concentration field measurements. MVP participants include personnel from 30 and 45 SPW (and their contractors), SMC, The Aerospace Corporation, NASA, and NOAA. Key functions include program planning, field data collection, data review and compilation, range coordination, and model validation (see Appendix B).

This report presents measurements performed at CCAS during the Titan IV #K21 launch. Infrared imagery measurements were made on the launch cloud in an attempt to monitor its growth, stabilization, and trajectory. Ground-level doses of HCl were also measured during this launch at selected locations near the launch pad. The imagery and ground-level HCl measurement results are presented in Sections 2 and 3, respectively. REEDM predictions of ground-cloud stabilization heights and surface concentrations are shown in Appendix C. Rawinsonde measurements of meteorological data determined prior to launch are tabulated in Appendix D.

The imagery data obtained show that, for the meteorological conditions present during the November, near-midnight #K21 launch, the T – 0.7 hour REEDM calculation underestimates the cloud's stabilization height (1131 m versus 1375 m). The REEDM-predicted stabilization height for #K21 agrees better, however, with the imagery-derived stabilization height than do the corresponding values for the May #K19 and July #K23 daytime launches, where the ground clouds stabilized at heights twice those predicted by REEDM. REEDM overestimates the cloud's stabilization time (7.7 min versus 4–5 min) for #K21, but underestimates the stabilization time for #K19 and #K23. The results presented in this and subsequent reports will allow the accuracy of REEDM and other launch range atmospheric dispersion models to be determined over the range of possible meteorological conditions.

2. Imagery of the Titan IV #K21 Ground Cloud

[The material in this section was contributed by R. N. Abernathy, B. P. Kasper, and R. F. Heidner III of the Environmental Monitoring and Technology Department of The Aerospace Corporation's Space and Environment Technology Center]

2.1 Background

The Aerospace Corporation has been deploying visible and/or infrared imaging systems to Titan IV launches for over a year. These deployments include Titan IV missions #K07, #K09, #K10, #K14, #K15, #K19, #K21, and #K23. Typically, two-dimensional cloud images are recorded at each of two or three imaging sites and are combined in a pairwise fashion to produce stereoscopic 3-D information about the exhaust cloud. When atmospheric conditions were favorable, and two (or more) imagery sites were manned (i.e., #K07, #K15, #K19, #K21, and #K23), the analysis of these data yields the ground cloud's rise time, stabilization height, dimensions, ground track, and ground speed. These imagery data and the resulting cloud characteristics are available to modelers as part of the model validation program (MVP).

For #K21, only two of the three selected imager sites yielded data due to hardware failure. The analysis of the first 10 min of the imagery data yields the ground cloud's rise time and stabilization height. Due to low wind speeds and only two functional imagery sites, the analysis did not yield accurate values for the cloud's three-dimensional size, ground track, or ground speed. The raw infrared imagery data for the #K21 mission were recorded digitally in the AGEMA's computer system. Subsequently, all of the infrared imagery data were archived on magneto-optical disks as digital image files.

2.2 Introduction

On 6 November 1995, the Titan IV #K21 mission was successfully launched from CCAS SLC-40 at 00:15 EST (05:15 ZULU). This chapter describes the exhaust cloud imagery data collected by two imager sites during the 30 min immediately following the launch. It also briefly describes the data acquisition hardware and analysis software. Analysis of the first 10 min of this imagery yields the stabilization time, the stabilization height, the cloud dimensions (i.e., east to west length), the ground track, and the ground speed of the ground cloud without recourse to additional data sources. Rudimentary knowledge of the rawinsonde wind data is needed for more quantitative interpretation of the imagery data reported in this Chapter. These pre-launch rawinsonde data are documented in Appendix D and referenced in this Chapter. REEDM predictions are documented in Appendix C and referenced in this Chapter. Aircraft sampling of the exhaust cloud was not attempted for this midnight launch.

2.3 Field Deployment

2.3.1 Planning

The Aerospace Corporation's participants are listed in various subteams below (members of the imaging teams for #K21 are indicated with asterisks):

Technology Operations

Space and Environment Technology Center

Environmental Monitoring and Technology Department

R. N Abernathy — R. F. Heidner III

B. P. Kasper* — J. T. Valero*

G. J. Scherer* — K. L. Foster

Space Launch Operations

Systems Engineering Directorate

Environmental Systems

N. F. Dowling, Systems Director

H. L. Lundblad

Eastern Range

Systems Engineering Directorate

J. R. Ligda*

D. R. Schulthess*

2.3.2 Equipment

The equipment at each site included all the hardware and software necessary to record and document the launch, to communicate between sites, and to supply backup power in case of an outage at the fixed power distribution points. The launch of #K21 marked the third opportunity to deploy the Titan IV-dedicated Visible and Infrared Imaging System (VIRIS) hardware.

The VIRIS consists of an array of four cloud tracking systems and was designed and fabricated at the request of Space Launch Operations, Systems Engineering Directorate, at The Aerospace Corporation. Each tracking system consists of coaligned visible and infrared (IR) (8–12 μm) imagers, mounted on an azimuth- and elevation-encoding tripod, with an associated data acquisition and display console. The combination of visible and IR imagers permits cloud tracking in both daylight and darkness. The #K21 launch represented the first deployment of the VIRIS for a night launch. The unique capabilities built into the VCR hardware include digital insertion of imager azimuth (Az), elevation (El), time, and GPS location. The system electronics are integrated in a single package, which has been ruggedized for field use. Prewiring of this package makes deployment of these imager systems straightforward, usually requiring less than 45 min for instrumentation at a site to become fully operational.

For the Titan IV #K21 mission, the operators at the UCS-7 site and at the SLC-34 blockhouse site set the FOV of the IR imagers to their maximum (i.e., $20_V° \times 40_h°$) value using the standard AGEMA IR lenses.

Both imaging systems deployed for the Titan IV #K21 mission were capable of total autonomy. Differential-ready GPS receivers documented each imager's position with moderate spatial resolution. Typically, 35 m is the precision in the horizontal plane. Gasoline powered AC generators (Honda Ex1000) are insurance against loss of fixed power. The Stirling cooler option for the AGEMA 900 series IR imagers was chosen so that liquid nitrogen would not be required at the sites. Each unit was transported in a standard utility wagon (e.g., Ford Explorer).

The Az/El angle encoder for all imager systems was calibrated using reference objects (e.g., SLC-40) within the field of view of the imagers. When reference objects are not part of the geodetic survey database, the GPS location uncertainty is the dominant term in the positional accuracy. Imager pixelation and operator error in edge detection contribute as well to the error in defining the cloud boundary. Step-size in the tripod angle encoders is a third source of error. Typically, the VIRIS system provides 0.1° precision. The accuracy is usually determined by the availability of optimal references for Az/El calibration.

2.4 Processing of Imagery Data

The processing of the imagery data requires several transformations that are performed upon return to The Aerospace Corporation:

1. Digitizing frames of visible imagery was not required for this night launch.
2. Measuring the pixel locations of the reference sites within each image (i.e., FOV and angular calibration).
3. Measuring the pixel locations of cloud features in digitized images.
4. Converting pixel locations to azimuth and elevation readings.
5. Calculating cloud characteristics (i.e., position in Cartesian coordinates relative to the launch pad).

The processing requires the use of specialized hardware and software. Time, Az, and El are tabulated for each digitized image. Because one imager system malfunctioned, pairs—instead of triads—of digitized images exist for selected times following the launch. A setup file is created for each of these pairs, containing all relevant information necessary to compute the cloud geometry. The Aerospace program **PLMTRACK** is run to digitize the x, y, and z coordinates of cloud features.

PLMTRACK is a software program developed in the Environmental Monitoring and Technology Department (EMTD) of The Aerospace Corporation by Brian P. Kasper. It is designed to analyze pairs of cloud images synchronized in time. The operator selects the location of a particular cloud feature in the images from the two imager sites by moving a screen pointer over the desired point in

each image and clicking a mouse button. **PLMTRACK** then calculates the three-dimensional location of this point and writes the information to a data file.

Another implementation of **PLMTRACK** is the "box method," illustrated in Figure 1. The operator draws a rectangle about a cloud feature in the images from the two imager sites by moving a screen pointer to the extreme corners of the rectangles and clicking a mouse button. **PLMTRACK** then calculates the closest approach for various rays as illustrated in Figure 1 and described below. The top of the cloud is defined by rays determining T1 and T2 (i.e., T1 × T2); the bottom is determined by rays defining B1 and B2 (i.e., B1 × B2); and the middle is defined by the geometric mean of top and bottom (i.e., M1 × M2). To define the "faces" of the polygon surrounding the cloud, the points of closest approach for ray M1 with L2 and R2 (the left and right tangents to the cloud from Imager 2) are defined (i.e., M1 × L2 and M1 × R2). A similar procedure is used to define the points of closest approach for M2 with L1 and R1, yielding M2 x R1 and M2 × L1. Thus, seven points are defined for the "cell" surrounding the cloud (a point in the center of each of the six faces, plus a middle point). Four additional points are calculated by **PLMTRACK** (L1 × L2, L1 × R2, R1 × L2, and R1 × R2), and they define the extreme vertices of a polygon projected onto the ground plane and surrounding the observable cloud. All eleven points are written to a comma-separated-variable file.

When three imagers are viewing the cloud simultaneously (as planned for #K21 and accomplished for #K19 and #K23), a six-sided polygon method (documented in Figure 2) has been employed as an initial step in our plan to determine cloud volume as a function of time. With three imagers, there is a triply redundant determination of the top, middle, and bottom of the cloud by **PLMTRACK**. The horizontal extent of the cloud is determined by defining the rays from each imager that are tangential to the widest part of the cloud as seen from that site. Projection of these extreme rays for each imager on the x-y ground plane forms a six-sided polygon that bounds all material in the cloud at all altitudes, as shown in Figure 2. When the polygon area is combined with the mean cloud height (i.e., the difference between the top and the bottom) of the cloud, one can obtain an upper bound for cloud volume. This upper bound volume may *significantly* overestimate the volume of the cloud. The utility of the polygon method has been documented in a previous report for the #K23 mission. In that report, the polygons from imagery were correlated with aircraft HCl measurements of cloud dimensions and average HCl concentrations for the Titan IV #K23 launch cloud. After correcting for Geomet time response, the #K23 dataset established that HCl concentrations detectable by an aircraft-based Geomet total HCl detector were mostly contained by the six-sided polygon areas for the first 20 min after launch. Even though no aircraft data were collected during the #K21 mission, the #K23 data established that the imagery-derived position of the visible cloud correlates with the measurable HCl concentrations. In a separate report, the #K19 imagery data documented the correlation of infrared with visible imagery. Therefore, the #K21 infrared imagery documents the extent of the measurable HCl during the first few minutes after launch.

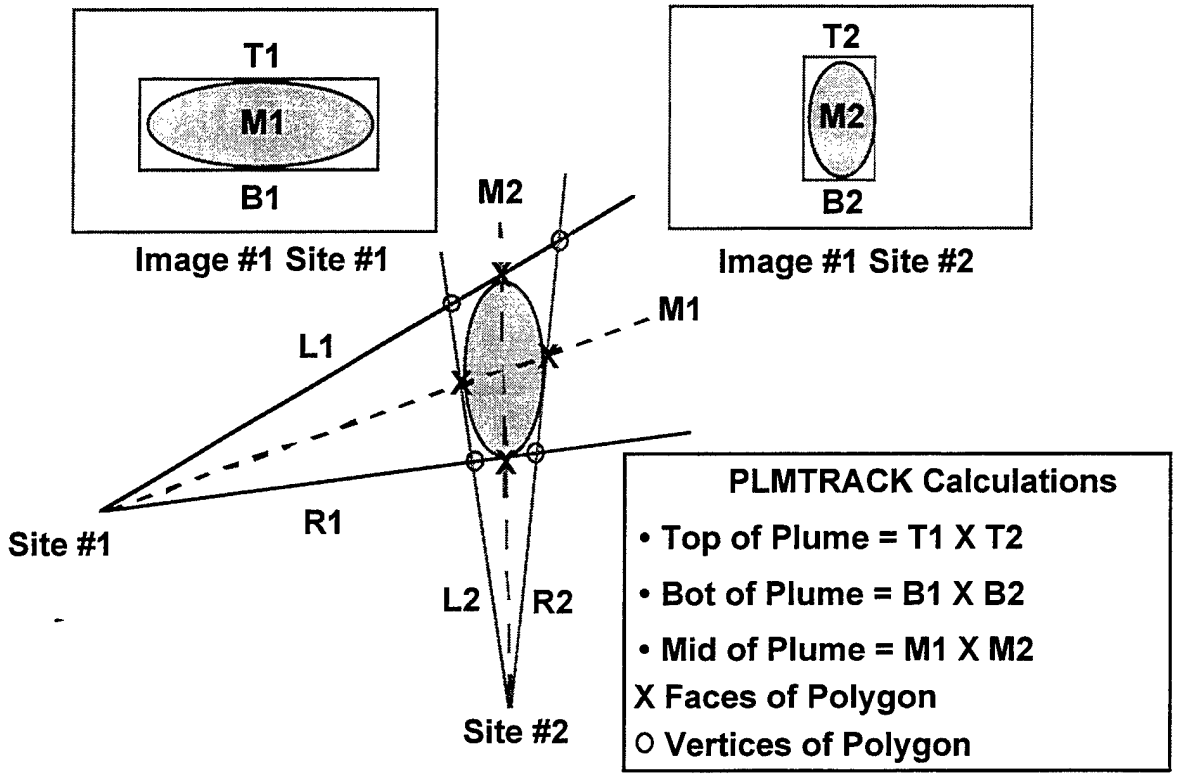

Figure 1. Implementation of the "box" method with two imagers.

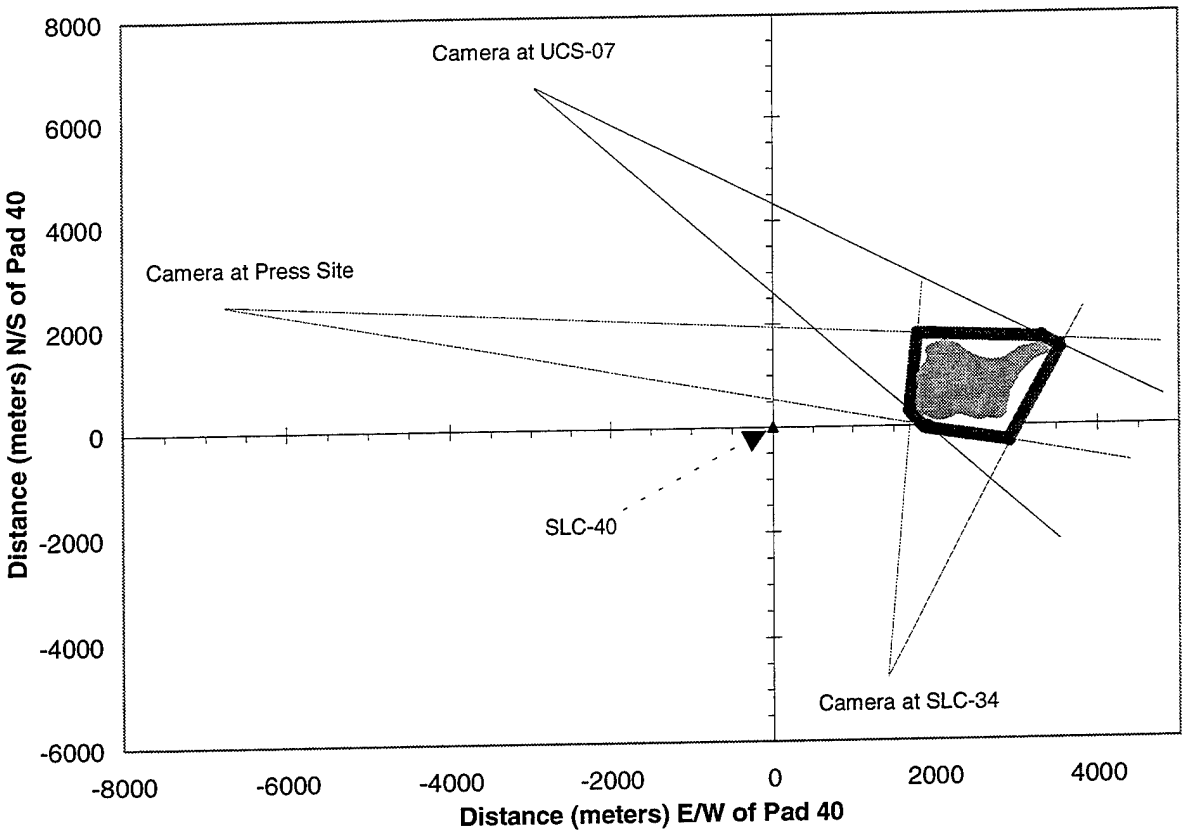

Figure 2. Implementation of the six-sided polygon method for three imagers. The imager positions and rays as well as the cartoon of the cloud were synthesized for heuristic purposes. Only two imagery sites were functional for #K21.

2.5 Results and Discussion

2.5.1 Correlation of Ground-Cloud Trajectory with Wind Direction

Figure 3 presents the REEDM predictions for the trajectory of the exhaust cloud (82–94° rawinsonde convention [defined fully in Subsection 2.5.5]) as well as the rawinsonde-derived wind directions associated with the altitudes for the bottom (111°), middle (289°), and top (289°) of the stabilized ground cloud (as determined by infrared imagery). Figure 3 also documents the locations of the rawinsonde release site and of the two imager sites (UCS-7 and SLC-34) chosen by The Aerospace Corporation in order to image the #K21 exhaust cloud. REEDM predicts cloud maxima at vectors of 82° for the surface and 94° for the predicted stabilization height (1131 m) of the cloud based upon the T–0.7 hour rawinsonde sounding. Due to the low wind speeds, the ground cloud did not move along its track far enough to allow an accurate measure of its trajectory during the 10 min of imaging. The T–0.7 hour REEDM calculations provide concentration isopleths at the height of the stabilized cloud. Review of these isopleths reveals maximum concentrations just slightly to the west of the launch pad. This prediction is consistent with the imagery.

It is evident from examination of Figure 3 that the 82–94° trajectory predicted by REEDM aligns more closely with the wind direction at the bottom (111°) of the cloud (at 886 m as derived from imagery) than at the middle or top (approximately 289° for the imaged heights of 1375 and 2120 m). The upper winds predict that the cloud would have moved out to sea (to the east). As illustrated in the next section, the imagery documents that the ground cloud rises and stabilizes almost directly above the launch pad, as observed from the northern and southern imager perspectives. This is qualitatively in agreement with the low wind speeds and strong sheers documented by the T–0.7 hour rawinsonde data. The camera angles do not provide a good measure of the cloud's position along the north/south axis since the cloud remained between the camera sites. The imagery also reveals that the higher altitude launch column moves to the east and separates from the almost stationary ground cloud at later times. This is consistent with the rawinsonde data that documents winds blowing from the west at altitudes near the top of the stabilized cloud. The T–0.7 hour rawinsonde data in Figure 3 are documented in Appendix D. The REEDM predictions in Figure 3 are documented in Appendix C.

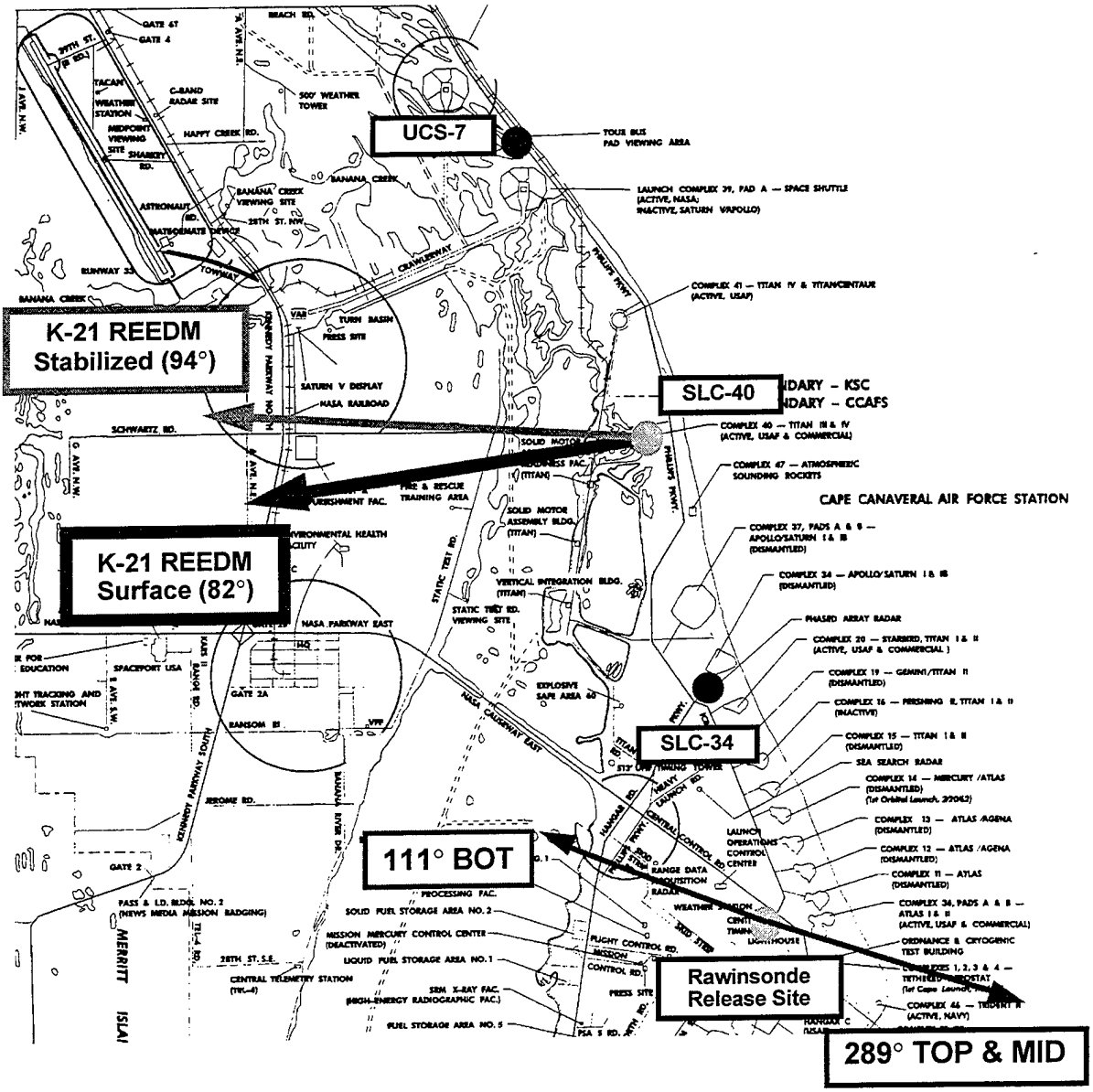

Figure 3. Map documenting the imagery sites, the rawinsonde release site, the REEDM predictions for the #K21 ground cloud's track, and wind vectors for the top, middle, and bottom altitudes for the imaged cloud. The wind vectors and REEDM predictions are based upon the rawinsonde sounding at 04:35 ZULU (T–0.7 hour). The imagery documented that the cloud rose and spread with little East/West movement. The camera angles are not optimum for documenting the North/South movement for the cloud that remained between the imagery sites. Therefore, no imagery-derived cloud trajectory was measured for the #K21 launch.

2.5.2 Images of the Titan IV #K21 Exhaust Cloud

As discussed in the previous section, the imagery data is qualitatively consistent with the T–0.7 hour rawinsonde data. Figures 4–8 are infrared images of the Titan IV #K21 launch cloud as seen from the imagery sites at the specified times after launch. It is immediately obvious that the cloud is not spherically symmetric in any of these images. Figure 4 documents imagery from SLC-34, which is south-southeast of the launch pad. Examination of this image reveals that the exhaust duct produces an asymmetry in the ground cloud by ejecting exhaust predominantly to the east (i.e., to the right in Figure 4) of the pad. The analyst used the top of the exhaust duct cloud as a marker for the top of the ground cloud during the first several minutes after launch. Figures 5–8 document imagery from UCS-07, which is north-northwest of the launch pad. Figure 5 documents the same cloud characteristics as Figure 4 except that east is to the left in Figure 5. In Figures 5–8, a sphere (i.e., presumably a cryogenic storage tank) is evident at ground level and provides a reference for the ground cloud's position relative to the launch pad. Based upon imagery from UCS-07 site (i.e., Figures 5-8), the ground cloud rose and stabilized without significant east/west movement relative to the launch pad. The top and bottom of the "ground cloud" are defined by the analyst after careful review of previous and subsequent imagery from both imagery sites. The analyst draws his "box" about the mass of the cloud that contributes to the stabilized ground cloud. Comparison of Figures 7 and 8 shows that the eastern end (i.e., the left end) of the ground cloud dissipated at later times, resulting in a gap between the eastern end of the ground cloud and the launch column. The separation of the high-altitude launch column and the lower-altitude ground cloud is consistent with the observed wind shear (Appendix D).

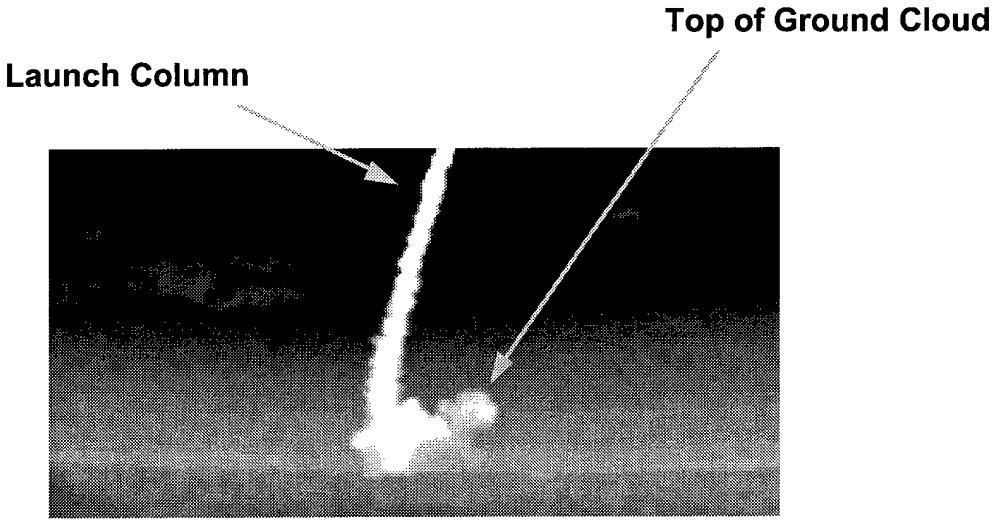

Figure 4. #K21 Launch Viewed from SLC-34 Blockhouse Roof at 00:30 (mm:ss after launch).

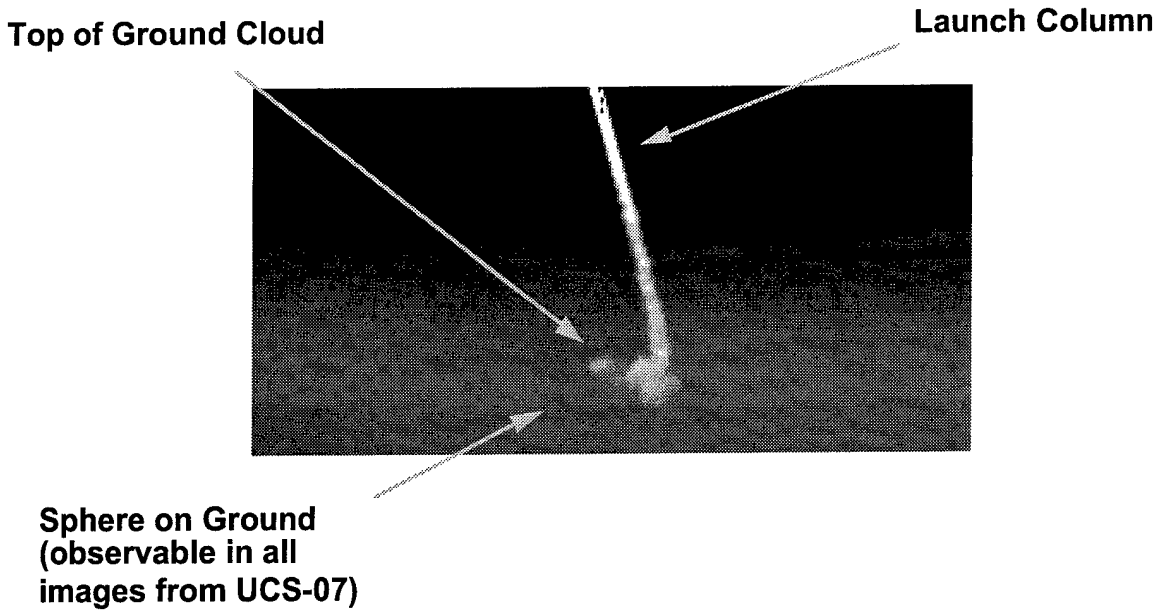

Figure 5. #K21 Launch Viewed from UCS-07 Site at 00:30 (mm:ss after launch).

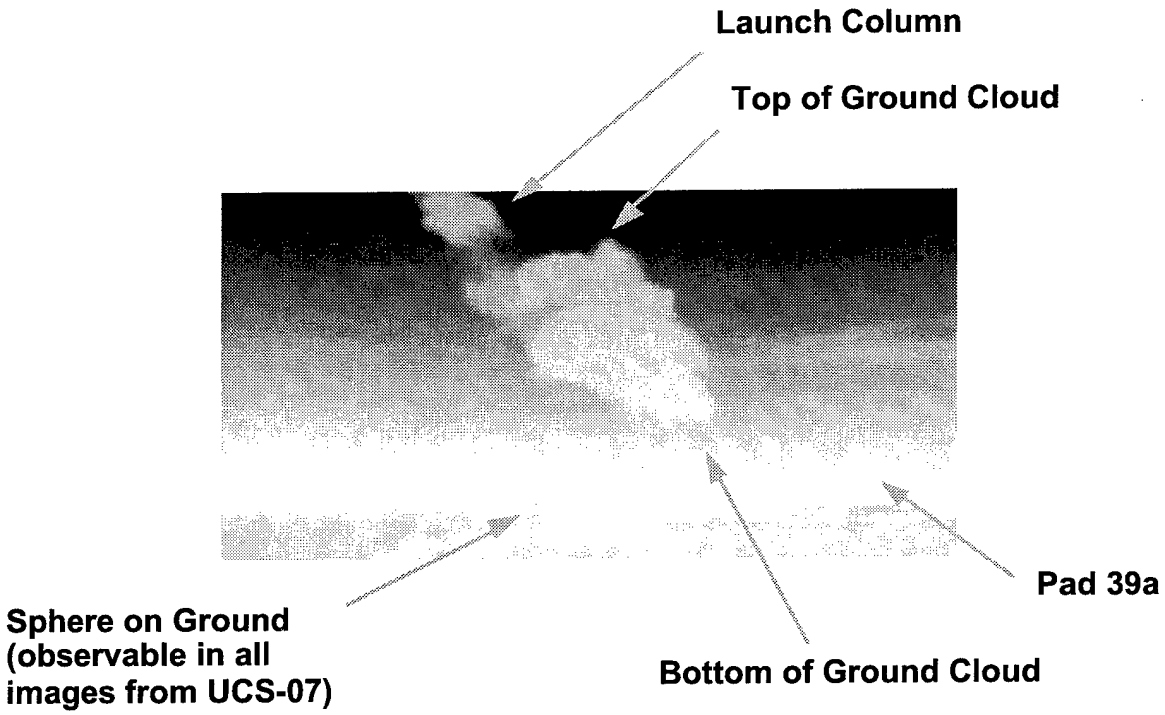

Figure 6. #K21 Launch Viewed from UCS-07 Site at 03:15 (mm:ss after launch).

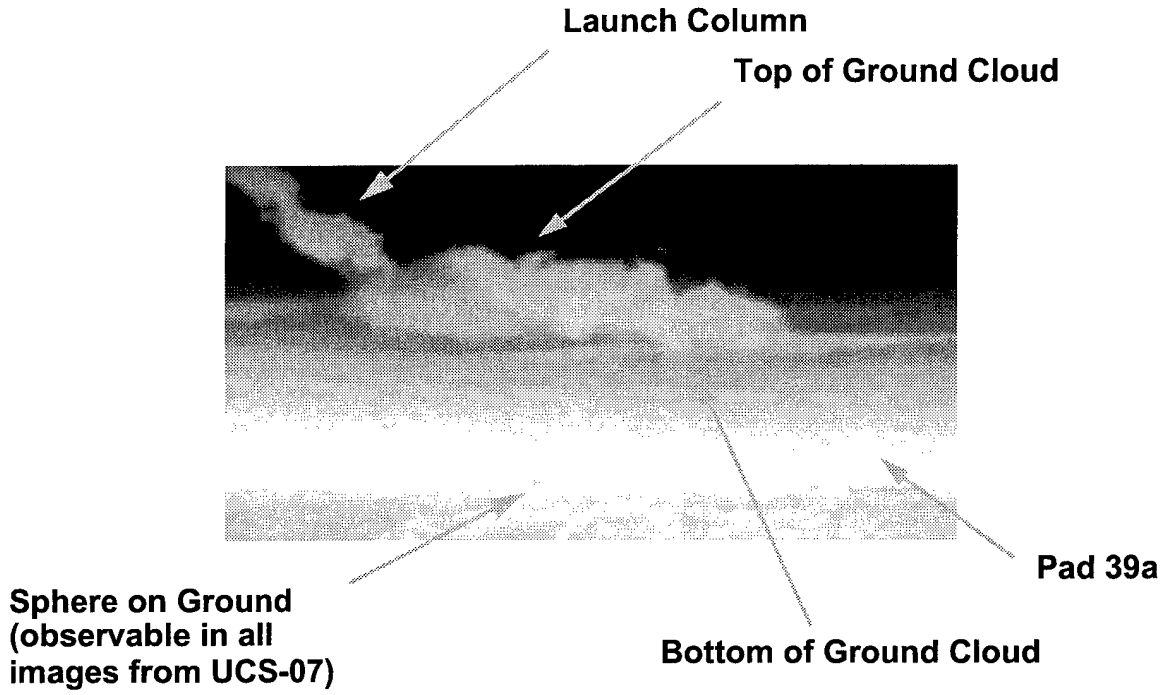

Figure 7. #K21 Launch Viewed from UCS-07 Site at 07:15 (mm:ss after launch).

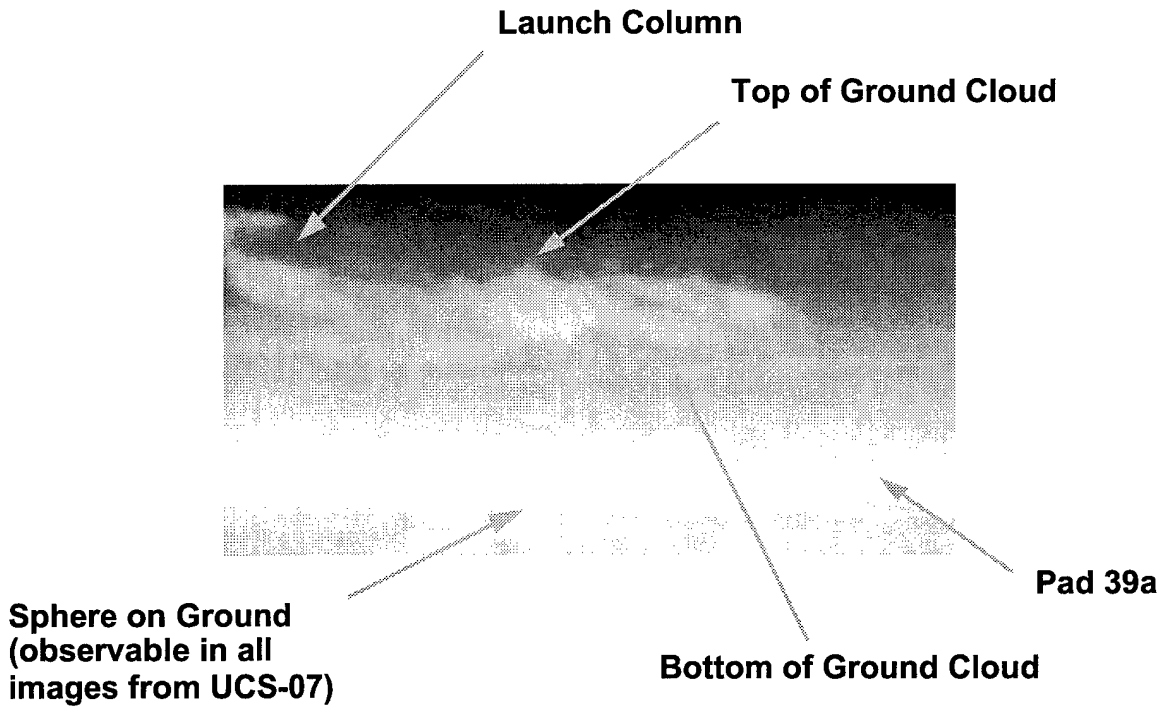

Figure 8. #K21 Launch Viewed from UCS-07 Site at 09:15 (mm:ss after launch).

2.5.3 Cloud Rise Times and Stabilization Heights

The plots presented in Figures 9–11 show the time-dependent altitude of the "bottom," the "middle," and the "top" of the ground cloud. The plots include a polynomial fit to the data and horizontal lines illustrating the stabilization height as well as the $\pm 3\sigma$ error levels. The shapes of the cloud rise curves are dramatically different, as are their stabilization times. The top of the cloud reaches its stabilization height within 3–5 min while the bottom continues to rise until 8–10 min after launch. The height of the top of the ground cloud decreases after rising to its maximum. The cloud was not imaged for long enough times to see a similar trend for the bottom of the ground cloud. The middle of the cloud is calculated from the top and bottom and, therefore, presents an intermediate behavior. The cloud's characteristic rise times and stabilization heights are compared to REEDM predictions in the next section.

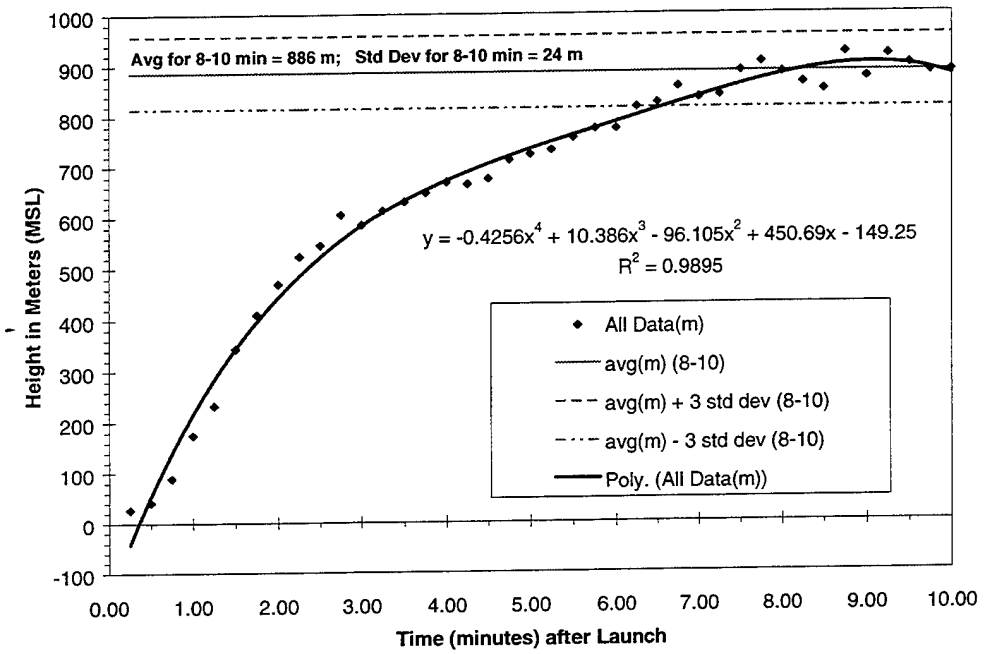

Figure 9. Cloud rise plot for the bottom of the #K21 cloud. The values of height (m) vs t (min) are displayed with the fourth-order polynomial fits and lines documenting the 3σ error bands as well as the stabilization height (886m). The variance (R^2) of 0.9895 indicates the high quality of the fit.

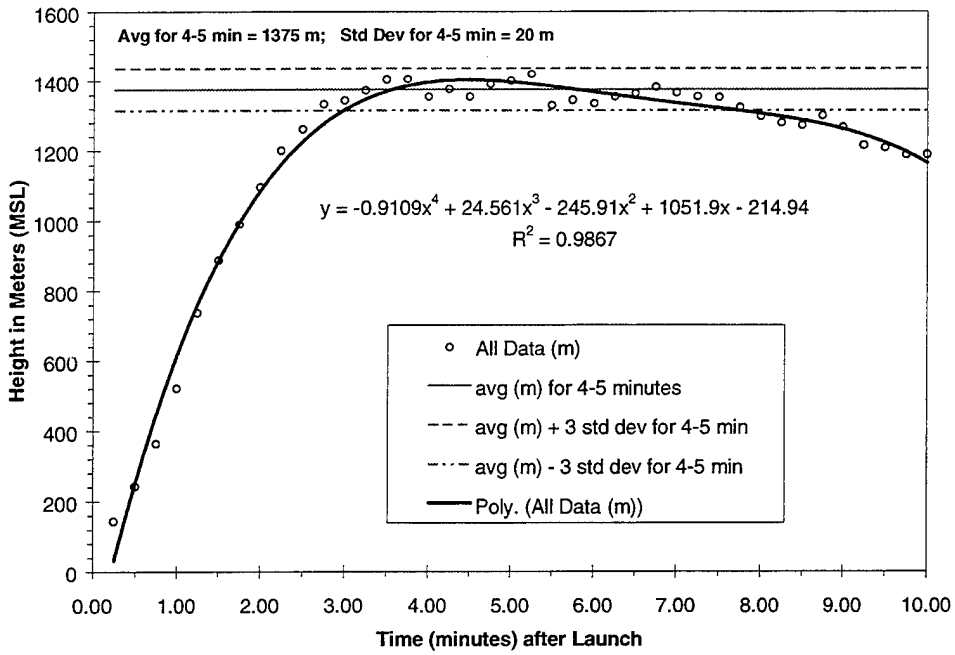

Figure 10. Cloud rise plot for the middle of the #K21 cloud. The values of height (m) vs t (min) are displayed with the fourth-order polynomial fits and lines documenting the 3σ error bands as well as the stabilization height (1375m). The variance (R^2) of 0.9867 indicates the high quality of the fit.

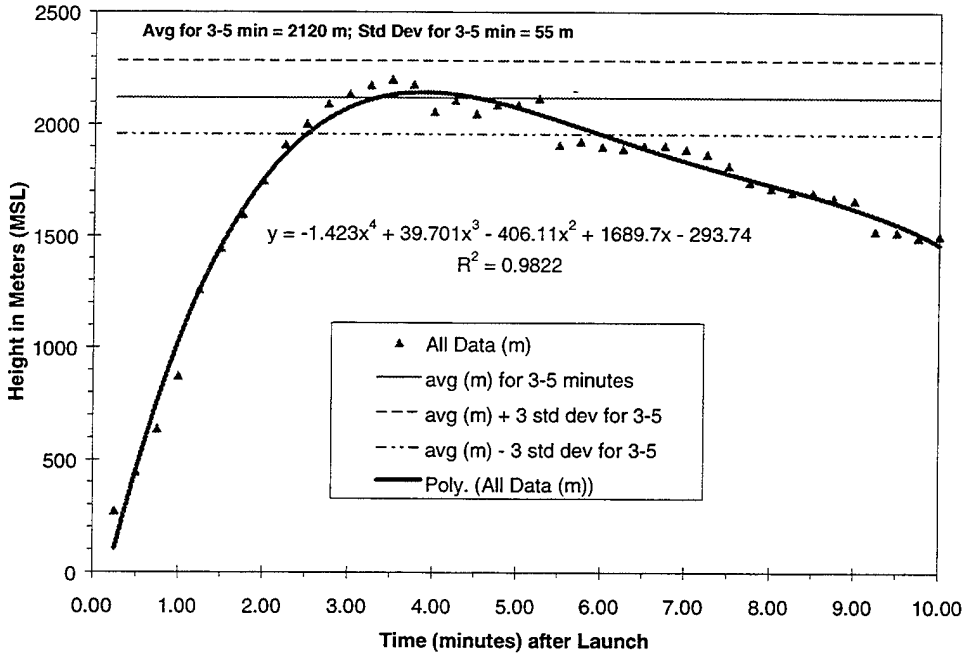

Figure 11. Cloud rise plot for the top of the #K21 cloud. The values of height (m) vs t (min) are displayed with the fourth-order polynomial fits and lines documenting the 3σ error bands as well as the stabilization height (2120m). The variance (R^2) of 0.9822 indicates the high quality of the fit.

2.5.4 Comparison of REEDM Prediction to Imagery Data

In Figure 12, the imagery-derived heights for the cloud's top, middle, and bottom are plotted with the T–0.7 hour REEDM prediction of the height for the cloud's middle against time. It can be seen that the measured stabilization height of the cloud's center (1375 ±20 m) is 22% higher than the value predicted by REEDM (1131m in Appendix C) using pre-launch rawinsonde data (Appendix D). The amount of time required to reach the stabilization height (approximately 4–5 min from the imagery) is significantly shorter than the 7.7 min predicted by REEDM. This is qualitatively evident from comparison of the shapes of the "middle" curves in Figure 12.

The variances (R^2) of the fourth-order polynomial fits to the data (i.e., Figures 9–11) indicate that the fits are very good. A polynomial fit was used in those figures as a convenient method to permit the representation of cloud overshoot and subsequent damped oscillation around the stabilization height. To be consistent with REEDM, stabilization time and height refer to the first maximum in these fits. REEDM predicts that the cloud goes through damped oscillatory motion with a period of $2\pi/S^{1/2}$, where S is the static stability parameter [Ref. 1, Eq. (7)].* Examination of Figures 10 and 12 shows that stabilization time is approximately 4–5 min for the #K21 ground cloud compared to 7.7 min for REEDM. Sensitivity of REEDM predictions to input parameters has been examined by Womack.†

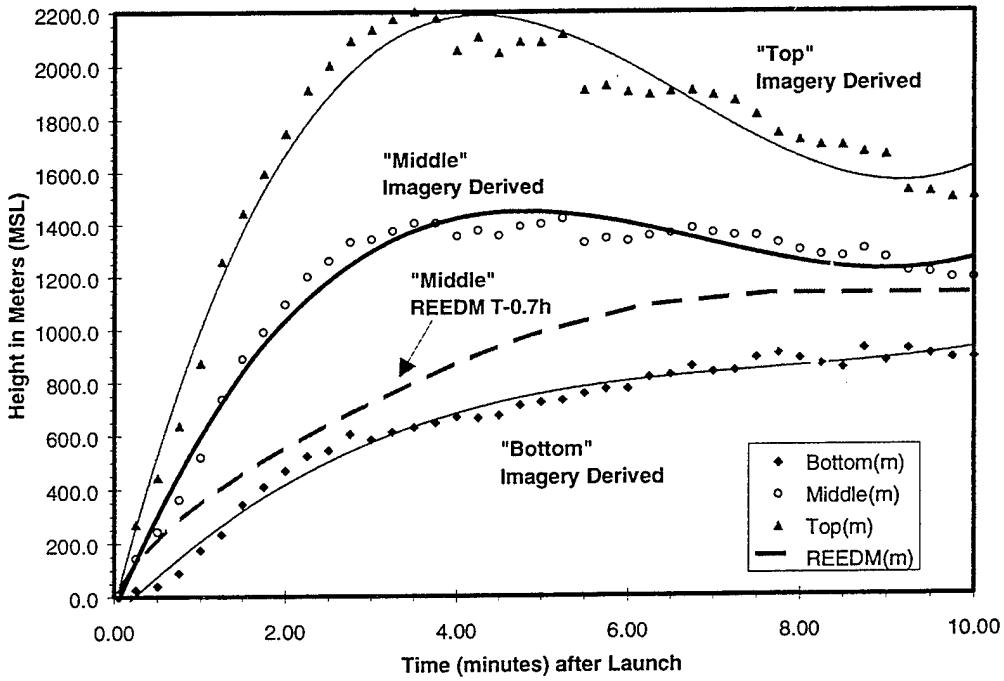

Figure 12. The imagery derived heights for the top, middle, and bottom of the ground cloud (Figures 9–11) are plotted as H(t) vs t. The T–0.7 hour REEDM modeling run predictions for the cloud middle are presented for comparison.

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* J. R. Bjorklund, User's Manual for the REEDM Version 7 (Rocket Exhaust Effluent Diffusion Model) Computer Program, Vol. I, TR-90-157-01, AF Systems Command, Patrick AFB, FL (April 1990).

† J. M. Womack, *Rocket Exhaust Effluent Diffusion Model Sensitivity Study*, TOR-95(5448)-3, The Aerospace Corporation, El Segundo, CA (May 1995).

Careful imaging of launch ground clouds under a variety of meteorological conditions is a vital element in REEDM evaluation.

2.5.5 Cloud Trajectory and Speed

Figures 13 and 14 present data for the ground track and for the displacement of the cloud from the launch pad as determined by infrared imagery. The "box" method of analysis for the imagery data does not yield independent values of the cloud track for the top, middle, and bottom of the cloud. We have chosen to present data for the middle of the cloud as defined by **PLMTRACK**. The camera angles do not provide an accurate measurement of the position of the cloud along the north/south axis since the cloud remained between the camera sites for the entire 10 min of tracking.

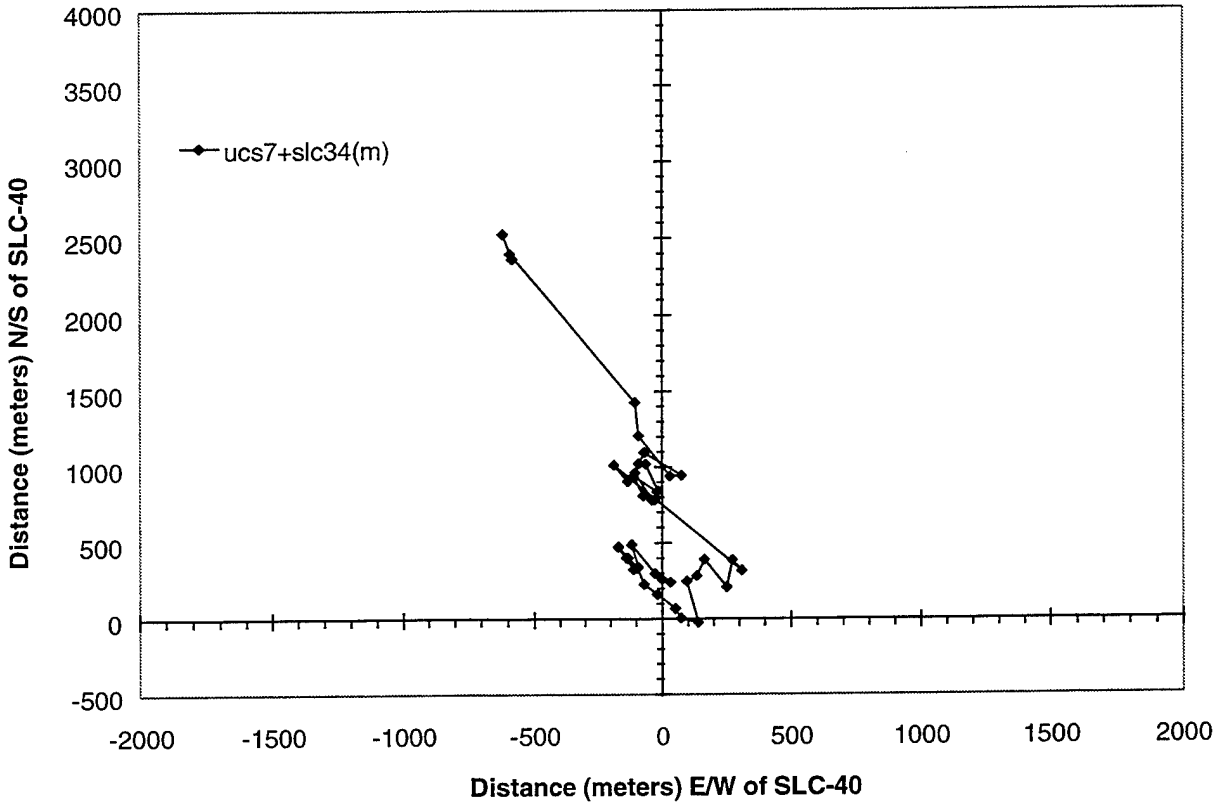

Figure 13. Ground track for the middle of the #K21 launch cloud. Due to the low wind speeds, the cloud remained between the imagery sites for the entire 10 min of tracking. Therefore, the scatter in the imagery-derived position data precludes the accurate determination of the trajectory of the stabilized launch cloud. The three points at the greatest distance N/S of SLC-40 correspond to the dissipation of the eastern end of the cloud.

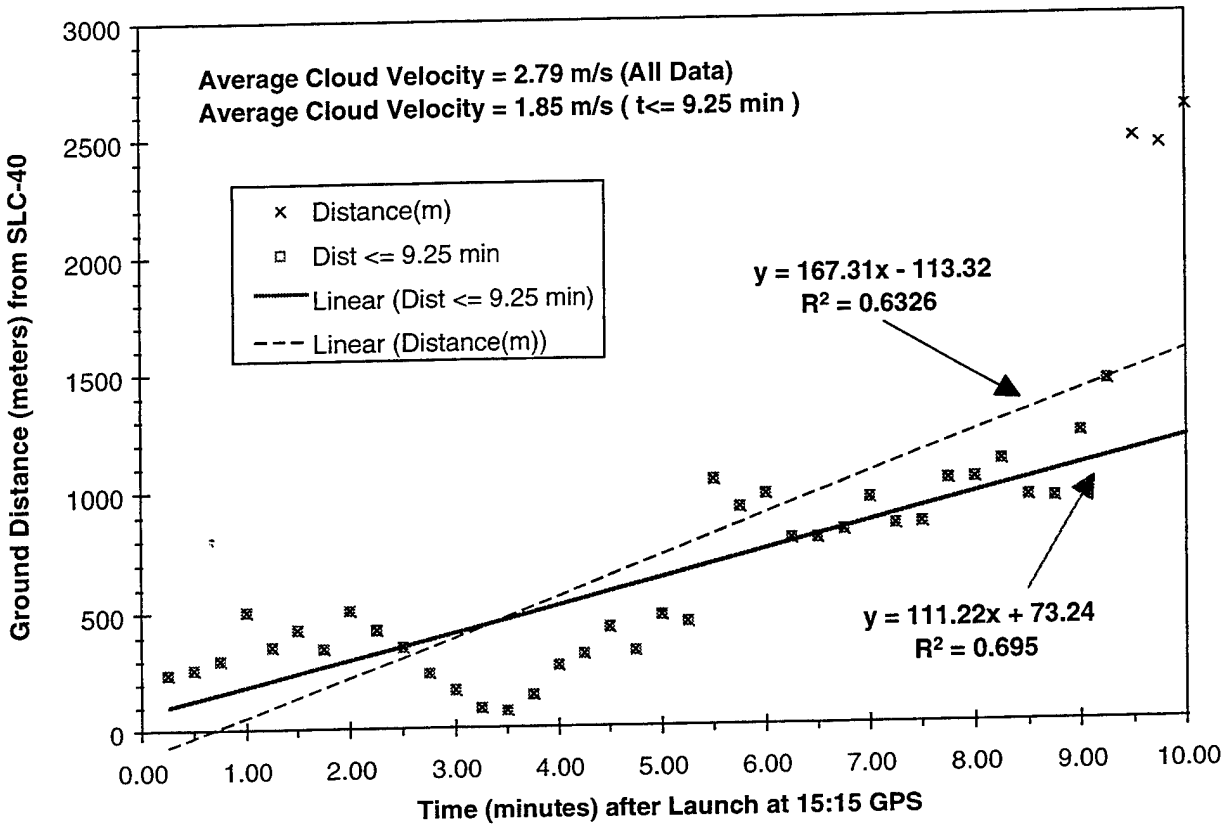

Figure 14. Ground distance for the middle of the #K21 launch cloud from the launch pad. The observed position of the eastern edge of the cloud jumped significantly at late times when the eastern edge of the ground cloud dissipated. This resulted in the three "apparently scattered" values at late times. The slopes and variances ($R^2 = 0.6326$ and 0.6950) of the linear fits to the data (i.e., all data or just the data at $t \leq 9.25$ min) are reported. The slopes yield ground speeds between 1.8 and 2.8 m/s. The low values of the variances reflect the scattered data resulting from the poor imagery angles for tracking the almost stationary cloud that remained between the imagery sites.

To be precise, the ground track in Figure 13 represents the ground-plane projection of the trajectory of the middle of the cloud as a function of time. For higher wind speeds, an "average" ground track is normally computed as a single linear fit to the position data using the following formula:

$$Y = mX + b, \tag{1}$$

where Y is the distance in meters along the north-south axis, m is the slope of the fit, X is the distance in meters along the east-west axis, and b is the intercept for the fit. We normally permit the intercept (b) to be nonzero since the cloud from the duct, coupled to low-altitude wind shear, can combine to make the apparent origin of the cloud different from the location of the launch complex. That displacement can also be modeled within the REEDM code during cloud rise.

In this report, the angles will conform to the convention of rawinsonde wind vectors (the angle from which the wind originates that would push the cloud to its imaged position). Thus, the angles are related by

$$\vartheta = 180 + \Phi \tag{2}$$

where ϑ is the equivalent rawinsonde wind angle, and Φ is the measured polar angle of the cloud relative to SLC-40 and clockwise of true north. For example, when the cloud is due east of SLC-40, Φ is 90°, and ϑ is 270°. The slope (m) of the fitted line is determined by the angle θ, where $\theta = \tan^{-1} m$, and therefore $\Phi = 90° - \theta$.

Figure 14 presents data derived from the pair of infrared imagers. The ground distance of the cloud from SLC-40 increases with time. A linear fit to these data provides a rough estimate for the velocity of the stabilized cloud. As mentioned previously, the imagery could not accurately assess the north/south movement of the almost stationary cloud since it remained between the two camera sites. The imagery documents 1.8 to 2.8 m/s ground speed using early time ($t \leq 9.25$ min) and all of the data, respectively. However, the low values for the variance for these linear fits (i.e., R^2 between 0.6326 and 0.695) are consistent with the poor camera angles and low velocity of the cloud. Therefore, one can only conclude that the observed velocities are qualitatively consistent with the low wind speeds recorded during the T–0.7 hour rawinsonde sounding (Appendix D).

2.5.6 Cloud Growth along the East/West Axis

Figure 15 documents the imagery-derived positions of the west and east ends of the cloud during the first 10 min after launch. The ends are calculated by **PLMTRACK** as the nearest approach for the left ($\tilde{L}$) and right (R) rays from the two camera sites (i.e., camera site 1 = UCS-07; camera site 2 = SLC-34 blockhouse roof). Within the first 15 s after launch, the cloud had a width of 1000 m. There is considerable scatter in these data. This scatter results from the poor viewing angles for the almost stationary cloud. The best viewing angle for two cameras viewing a cloud would be 90° camera-to-camera using the cloud as the vertex. When the cameras are looking from the same perspective (0°) or at each other (180°), the data cannot be used to determine the distance of the cloud from the camera sites or the cloud's depth. Using imagery from 90° camera angles results in the most accurate determination of both the cloud's position and dimensions. When one of the camera angles aligns with the wind vector, the 90° camera angles can document the width and length of the cloud relative to the wind direction (i.e., most easily compared to REEDM). Unfortunately, the cameras view the #K21 launch pad from almost opposite perspectives (i.e., 131° camera angle).

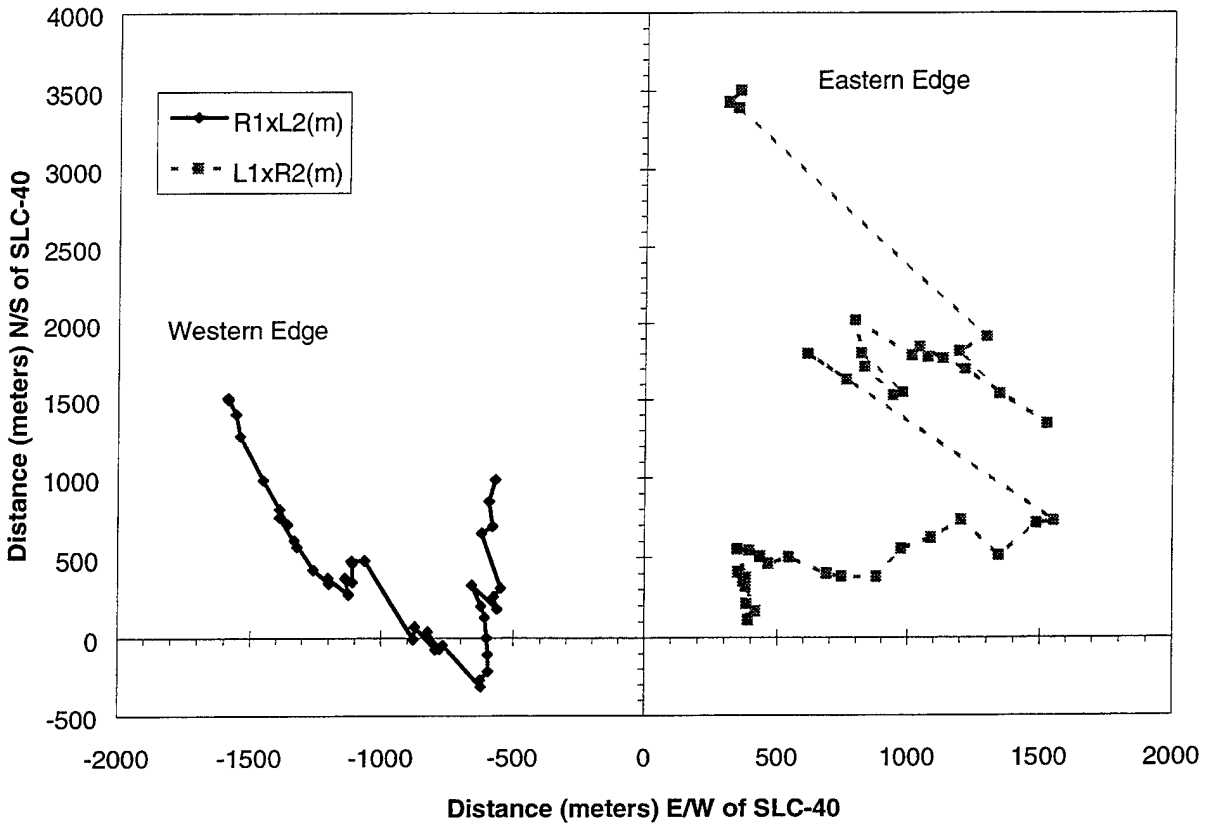

Figure 15. Position of the western and eastern edges (derived from imagery) of the #K21 launch cloud. The edges are calculated from the nearest approach of the right (R) and left (L) rays from imager 1 (UCS-07) and imager 2 (SLC-34). The observed location of the eastern edge jumped significantly at late times when the eastern edge of the ground cloud dissipated (see Figures 7 and 8). These most distant points correspond to the three points at late time in Figure 14.

2.5.7 Comparison of REEDM Prediction to Imagery Data—Summary Table

Table 1 summarizes the imagery derived, rawinsonde measured, and REEDM-predicted data for the #K21 launch cloud. Visible imagery was not attempted for the night launch. Since the cloud remained between the imagery sites, it was not possible to accurately measure cloud bearing or speed. However, several conclusions are derived from review of the contents of Table 1:

(1) the cloud stabilized at an altitude (1375 m) that is 22% higher than predicted (1131 m) by the T–0.7 hour REEDM run;

(2) the cloud stabilized in 4 to 5 minutes, which is about 40% of the 7.7 min predicted by the T–0.7 hour REEDM run;

(3) the cloud's low apparent speed is consistent with the low (1–3.6 m/s) winds at altitudes below the stabilization height of the middle of the cloud; and

(4) the REEDM-predicted cloud direction (94° rawinsonde convention) is 195° from the average wind direction (289° rawinsonde convention) for the altitude of the middle of the stabilized cloud. This is consistent with the observed stagnation of the cloud between the imagery sites.

Table 1. Comparison of Imagery Data to T–0.7 hour Rawinsonde and REEDM

Attribute	Feature	Visible Imagery	IR Imagery	Rawinsonde T – 0.7 h	REEDM 7.05 T – 0.7 h
Height (m)	Top	#N/A	2120	#N/A	#N/A
	Middle	#N/A	1375	#N/A	1131
	Bottom	#N/A	8–10	#N/A	#N/A
Time (min)	Top	#N/A	3–5	#N/A	#N/A
	Middle	#N/A	4–5	#N/A	7.7
	Bottom	#N/A	8–10	#N/A	#N/A
Bearing (°)	Top	#N/A	#N/A	287–290	#N/A
	Middle	#N/A	#N/A	274–304	94
	Bottom	#N/A	#N/A	106–115	#N/A
Speed (m/s)	Top	#N/A	#N/A	10.3–10.8	#N/A
	Middle	#N/A	#N/A	1.0–3.6	1.46
	Bottoom	#N/A	#N/A	1.9–2.1	#N/A

The rawinsonde wind direction data document a strong shift in direction as a function of altitude (comparing middle to bottom wind directions in the table). This trend suggests that better prediction of stabilization height by REEDM would automatically correct the wind direction predictions, which are based upon the rawinsonde data at the predicted stabilization height.

2.6 Summary and Conclusions

The Titan IV #K21 mission was launched successfully from the Eastern Range (SLC-40) at 00:15 EST (05:15 ZULU) on 6 November 1995. Personnel from The Aerospace Corporation deployed three IR imaging systems (one of the three imagers malfunctioned) to monitor this night launch and to track the time evolution and the ground trajectory of the solid rocket motor exhaust cloud. The two functional imagery sites (UCS-7 and SLC 34) were located to the north-northwest and south-southeast relative to launch complex SLC-40. Imagery data were recorded for 30 min, although the cloud was tracked for approximately 10 min. When combined with the Az/El readings and the IRIG-B time data, the infrared imagery was used to quantify angular movement and growth of the cloud for 10 min after the launch. The launch of #K21 marked the third deployment of the Titan IV-dedicated VIRIS imaging platforms and the first VIRIS deployment for a night launch.

The definition of exhaust cloud geometric features was complicated by multiple contributions to the complex shape of the evolving cloud (i.e., asymmetric ejection from the exhaust duct, rapid rise of the hot ground cloud, and separation of the high-altitude launch column). The analyst included only the portions of the exhaust cloud that became incorporated into the stabilized ground cloud.

Analysis of the imagery data presented in this report has focused on determining parameters that are directly comparable to REEDM predictions. The most accurately determined quantities by imagery

are the cloud rise time, its stabilization height, and its trajectory. Using the T–0.7 hour rawinsonde data, REEDM predicted a stabilization height of 1131 m and a stabilization time of 7.7 min, while the infrared imagery yielded values of 1375 m (22% larger) and 4–5 min (40% of the predicted time). As a result of equipment malfunction (i.e., only two functioning imagery sites) and low cloud velocity along the east/west axis, the imagery data cannot be used to calculate accurate values for either the ground track or the ground speed of the exhaust cloud. However, the imagery data documented little movement of the cloud, which remained between the two imagery sites. Qualitatively, this observation appears to be consistent with the low wind speeds and 180° wind sheers between the middle and bottom of the stabilized cloud (imagery-derived altitudes). The rawinsonde wind direction (289° at 1375 m) is coincidentally 195° out of phase with REEDM's predicted trajectory (94° at 1131m). These data suggest that better estimation of the stabilization altitude by REEDM would automatically provide better cloud trajectories since it would use the wind direction at the correct stabilization height.

3. Ground-Level HCl Dosimetry

[The material in this section was contributed by Paul Yocom and Dan Curran of NASA KSC's Toxic Vapor Detection/Contamination Monitoring Laboratory.]

3.1 Equipment Preparation

Interscan electrochemical detectors for real-time HCl concentration monitoring were prepared for use by disconnecting the 0.5 liters per minute (LPM) pumps internal to the units and mounting 2.0 LPM sample pumps external to increase flow rate through the detector cell and decrease response time. The Interscan detectors were calibrated twice during the week prior to the launch, as well as one hour prior to launch. This was done to verify consistency of measurement by these detectors. On the Friday prior to the launch, a class on the calibration and operation of the modified Interscan detectors was given to Air Force personnel.

3.2 Dosimeter Monitoring

The primary goal for HCl dosimeter monitoring during this Titan IV launch was collection of ground-level data from around the launch facility. Dosimeters were fabricated on 1 Nov 1995. The calibration data for the prepared dosimeters is shown in Figure 16. Dosimeters were provided to Air Force

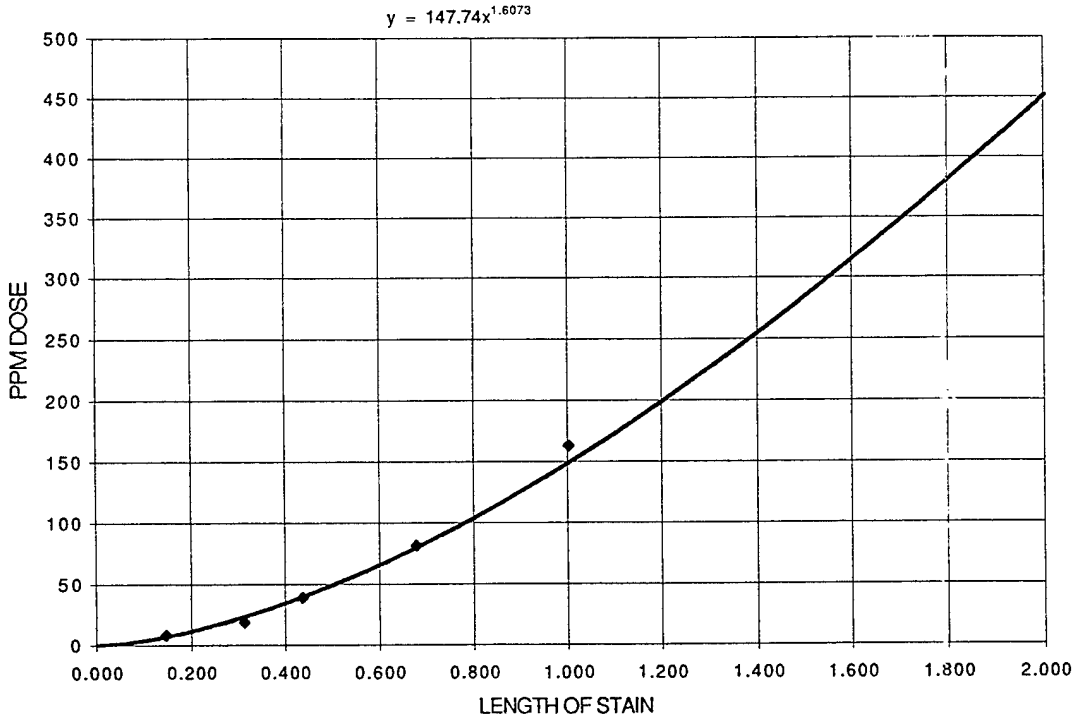

Figure 16. Calibration data for prepared HCl dosimeters.

personnel for near-field placement around the launch complex. Ten dosimeters were placed around Complex 40 the afternoon prior to the launch. Six were placed on the perimeter fence five feet above ground level approximately 600 ft (180 m) from the vehicle. Four dosimeters were placed on structures inside the fence, one on each lightning tower approximately 150 ft (45 m) from the vehicle. The approximate locations of the near-field dosimeters are shown in Figure 17.

3. 3 Ground-Level Monitoring Results

Five of the ten dosimeters placed in the vicinity of launch complex 40 inside the perimeter fence showed response indicating the presence of HCl. The results of these dosimeters are shown in Table 2. The highest doses were recorded at the lightning towers. From the HCl levels recorded by the dosimeters on the perimeter fence, it appears that the majority of the ground-level HCl moved northwest and south-southwest of the launch tower. Dosimeters placed in the same sites during the 14 May 95 launch also detected HCl at the perimeter fence locations. The dosimeters placed at these sites for the 22 Dec 94 launch with similar wind conditions did not detect HCl. This may indicate that during warmer weather conditions the effluent plume does not rise as quickly as it does when air and ground temperatures are cooler.

Table. 2. Near-field HCl dosimeter location, stain measurements, and doses.

Map Location	Dosimeter Location	Stain Length (in.)	Dose (PPM min)
1	N Perimeter Fence	0.0	0
2	W Perimeter Fence	0.0	0
4	SSW Perimeter Fence	0.054	1.36
5	S Perimeter Fence	0.0	0
6	ESE Perimeter Fence	0.0	0
7	ENE Perimeter Fence	0.0	0
8	NE Lightning Tower	Saturated	>380.01
9	SE Lightning Tower	0.0	0
10	SW Lightning Tower	Saturated	>380.01
11	NW Lightning Tower	Saturated	>380.01
20	NW Perimeter Fence	0.058	1.52

3. 4 Mobile Monitoring Teams Results

Three dosimeters to monitor HCl levels in each vehicle and three Interscan real-time HCl monitors were provided to the Air Force mobile HCl monitoring teams. They were not used because of the launch plume's projected direction of travel out to sea.

3. 5 Dosimetry Results Point of Contact

Please contact Paul W. Yocom, Titan IV HCl Monitor Work Order Lead, at (407) 853-5208 for further information regarding the ground-level HCl dosimetry measurements.

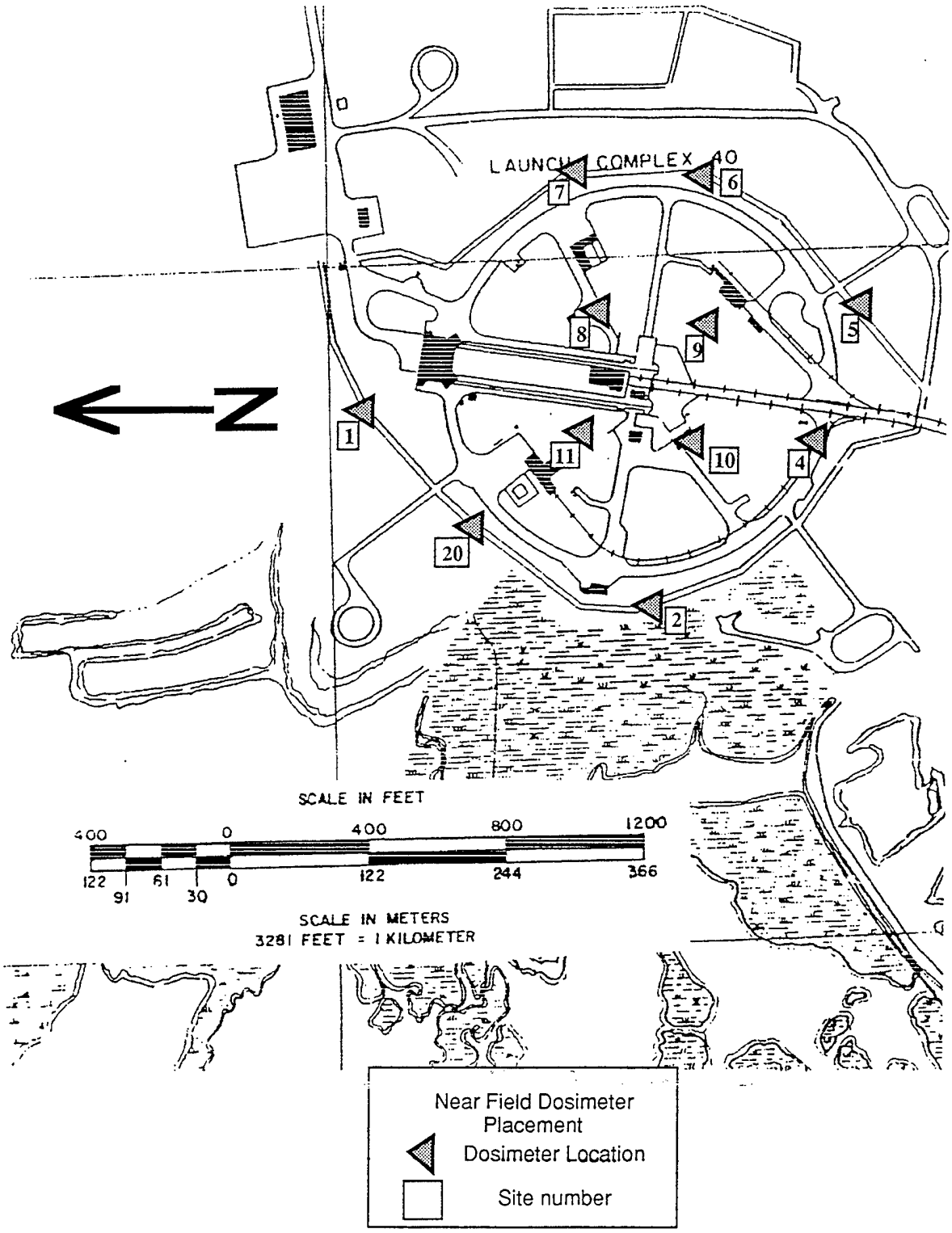

Figure 17. Locations of near-field dosimeters.

Appendix A—The REEDM Code

[Material in this Appendix was contributed by Bart Lundblad of The Aerospace Corporation's Environmental Systems Directorate]

The Rocket Exhaust Effluent Diffusion Model (REEDM) is used by range safety offices at the Eastern and Western Ranges to predict toxic hazard corridors (THCs) for a variety of launch vehicles, including Titan and Delta. The code was developed in 1982 for the Air Force by H. E. Cramer Co. Development was based on the earlier NASA multi-layer diffusion model. REEDM is currently operated and periodically modified by a range safety contractor. The latest version can run on a personal computer in several minutes. REEDM calculates atmospheric toxic concentrations based on vehicle emission, and meteorological and launch scenario data provided by the user. Although based on relatively simple atmospheric dispersion physics, the code is complex, with a large number of variables.

REEDM has not been fully validated, and the accuracy of its concentration predictions has been questioned. Key factors determining predicted values include the cloud source terms, cloud rise and stabilization, cloud transport, cloud diffusion, and atmospheric chemistry.

- **Source Term:** REEDM predicts vehicle-specific initial cloud characteristics for both nominal launch and catastrophic failure cases. These characteristics include mass, temperature, buoyancy, and upward momentum. The model does not fully account for exhaust interaction with the launch mount and deluge water. It also does not account for HCl removal via washout, impingement, and rainout.

- **Cloud Rise and Stabilization:** REEDM uses the initial cloud characteristics and the meteorological profile to predict exhaust cloud rise and stabilization. The altitude of the predicted stabilization and the distribution of the cloud about the stabilization height are important determiners of predicted ground-level concentrations. Questions persist as to whether REEDM correctly predicts cloud stabilization heights, and if it properly accounts for cloud interaction with inversion layers that tend to inhibit cloud rise. It is also thought to inaccurately predict air entrainment rates and distribution of cloud mass.

- **Transport:** REEDM uses a single mean wind vector to predict the downwind trajectory of the stabilized cloud. The vector is calculated by averaging wind vectors from the measured wind profile. This simple method will not produce accurate cloud trajectories. In addition, REEDM does not account for changes in wind direction as the cloud moves downwind. Use of a single wind vector results in predictions of straight line cloud trajectory. This method cannot accurately portray true cloud movement.

- **Diffusion:** REEDM uses parameters of atmospheric turbulence to predict the rate at which toxic species in the elevated cloud will diffuse back down to ground level. The diffusion rate used by the model is crucial to the prediction of ground-level concentration isopleths. The simple Gaussian diffusion scheme used by REEDM is probably not valid for elevated cloud diffusion. The stabilized cloud may tend to remain elevated and not readily diffuse to ground level.

- **Cloud Chemistry:** REEDM does not account for atmospheric chemical reactions of the launch cloud's toxic species. REEDM assumes that all HCl emitted remains in the cloud as gaseous HCl. There are important toxic removal processes occurring in the clouds that will reduce toxic ground-level concentrations. A valid model must account for these reactions.

Appendix B—Atmospheric Model Validation Program Activities

[Material in this Appendix was contributed by Bart Lundblad of The Aerospace Corporation's Environmental Systems Directorate]

The Atmospheric Dispersion Model Validation Program (MVP) is carrying out three major activities designed to validate REEDM: (A) the verification of REEDM's code, (B) the evaluation of REEDM's performance using empirical dispersion data, and (C) the establishment of the prediction confidence limits of REEDM based on the code and performance evaluations.

A. Code Verification

The REEDM code is being subjected to a rigorous review of its construction, equations, assumptions, default values, and uncertainties by a team of personnel with expertise in atmospheric modeling. This code verification process is providing a complete explanation of how the model uses input data to produce toxic concentration isopleths, including the inherent limitations that accompany these predictions. The code verification process will improve the understanding of the accuracy of code output and will provide essential information for ultimate model validation.

B. Model Performance Evaluation

The performance of REEDM in producing accurate toxic concentration predictions is being evaluated using empirical data collected during the monitoring of launch clouds and tracer gases. This evaluation process has three components: data collection, data archiving, and model comparison.

Data Collection: The launch ground clouds produced by nominal launches at the Eastern and Western Ranges are being monitored to collect data on cloud rise, growth, stabilization height, trajectory, diffusion, and toxic ground concentrations. Cloud monitoring potentially includes remote imagery (visible, infrared, and lidar) and both aerial and ground sampling of cloud constituents.

Releases of tracer gas (non toxic, invisible, and inert) at the Eastern and Western Ranges are being employed to supplement the launch-cloud monitoring data. The tracer gas is released at various altitudes during non-launch periods to simulate sections of a stabilized toxic cloud. The puffs and plumes of tracer gas are remotely imaged with infrared cameras and also detected in the air and at ground level. The tracer release activity will provide valuable information on cloud trajectory and diffusion patterns in the coastal environments at the ranges. Tracer release sessions are being conducted during different seasons of the year to account for seasonal variations in dispersion characteristics.

An important part of the field data collection activity is the production of a complimentary meteorological data package that can be used to evaluate the meteorological portions of REEDM. Data pro-

vided by the existing range meteorological network will be supplemented, as necessary, by the MVP to ensure that all necessary meteorological data are collected.

Data Archiving: A computerized data storage system will be created to archive cloud dispersion and meteorological data collected during the field activities. The data will be reviewed and reduced prior to archiving. The system will enable a rapid and accurate delivery of requested data to REEDM evaluators. The archive will remain as a valuable resource to be utilized during the evaluations of future range dispersion models.

Model Comparison: Model evaluators will run REEDM using archived meteorological data and compare its output with the empirical cloud dispersion data collected during the field activities. The cloud imagery data will be used to evaluate how closely REEDM can simulate cloud rise growth and stabilization. Imagery and aerial sampling of the launch and tracer clouds will permit evaluation of cloud trajectory and diffusion. The ground sampling data will allow a direct comparison between REEDM toxic concentration isopleths and the actual gas concentration detected at ground level. The aerial and ground sampling will also provide real cloud chemical composition data that will assist evaluation of atmospheric chemical reactions and conversions. The evaluation team will report on the overall accuracy of the REEDM predictions as well as the accuracy of each REEDM component: cloud rise, transport, diffusion, and ground concentration.

C. Establishment of Confidence Limits

The MVP will use the knowledge gained from the REEDM code examination and the REEDM performance evaluation to establish confidence limits for REEDM use and thereby validate REEDM. These confidence limits will be based on REEDM's strengths and weaknesses, and will provide guidance on interpretation of model predictions. Establishment of the confidence limits will validate REEDM by providing a firm basis for REEDM use at the ranges.

Appendix C—REEDM Code Calculations of Cloud Stabilization Heights and Ground-Level HCl Exposure Doses

[Material in this Appendix was contributed by Robert Abernathy of The Aerospace Corporation's Environmental Monitoring and Technology Department (EMTD)]

REEDM code calculations of cloud stabilization heights and ground-level HCl exposure doses are presented here from rawinsonde data determined at 04:35 Zulu time (T – 0.7 h). [Note: The REEDM calculated output presented here improperly labels T – 0.7 h as T + 23.3 h.]

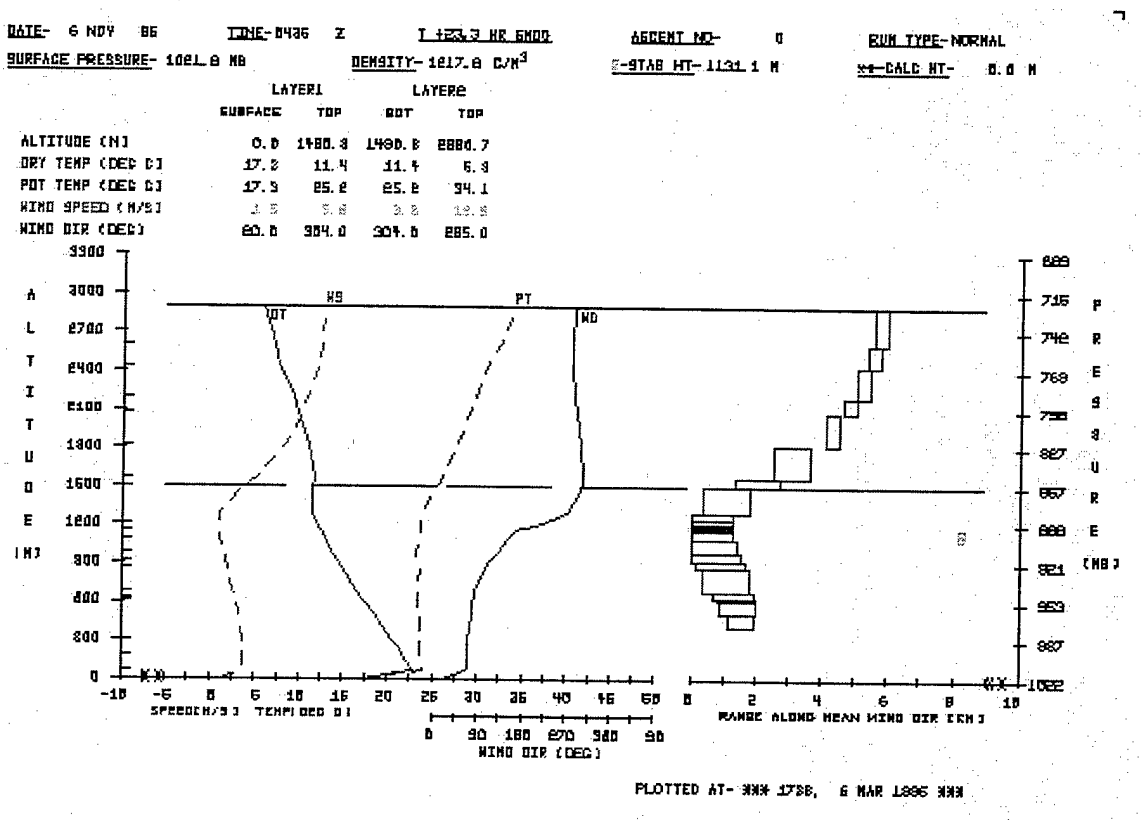

Figure 1: T-0.7h Rawinsonde Plot from REEDM Version 7.05

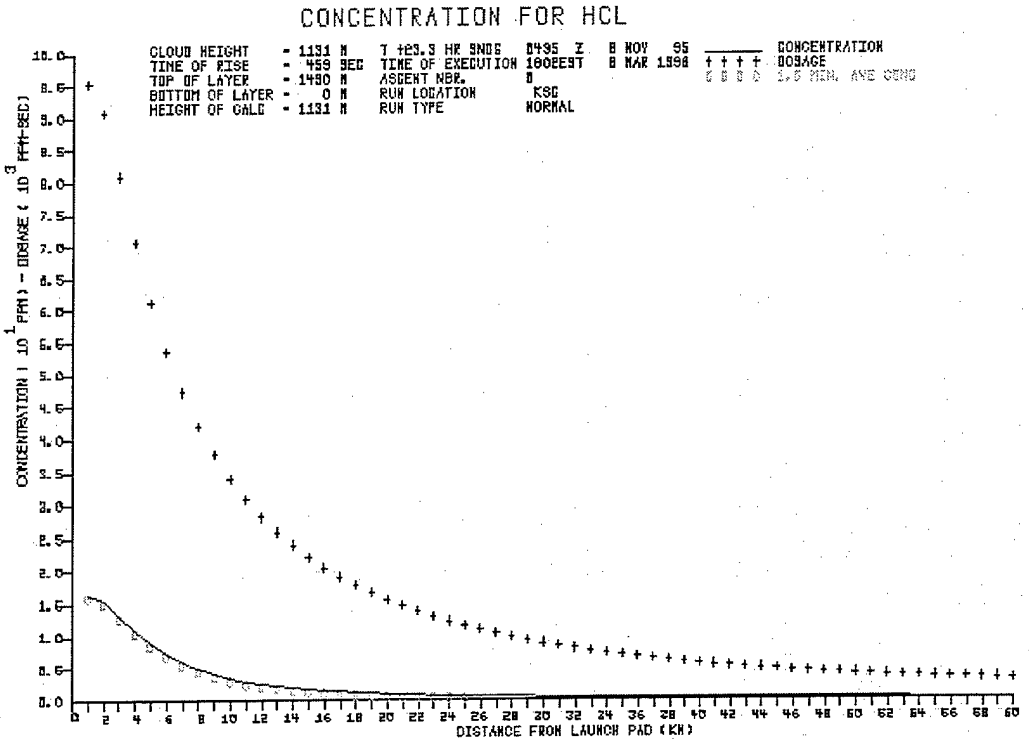

Figure 2: REEDM's Stabilized Cloud Concentration Predictions using T-0.7h Rawinsonde Data

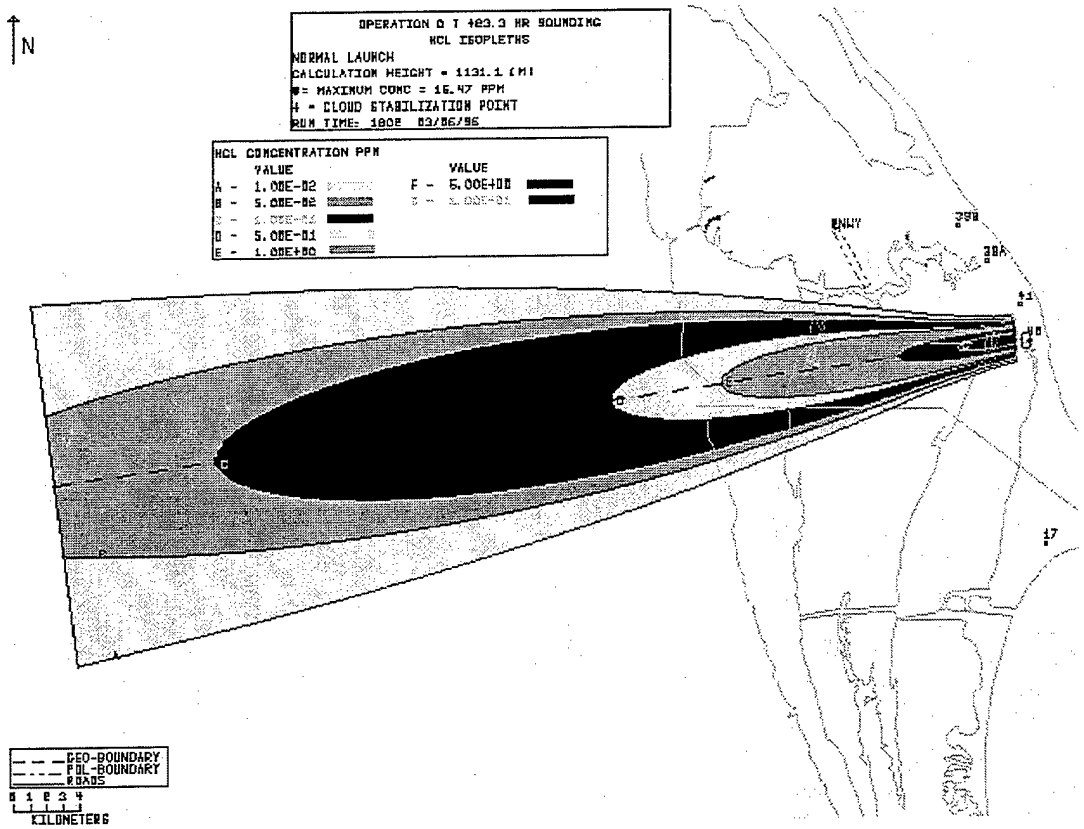

Figure 3: REEDM's Stabilized Cloud Isopleth Predictions Using T-0.7h Rawinsonde Data

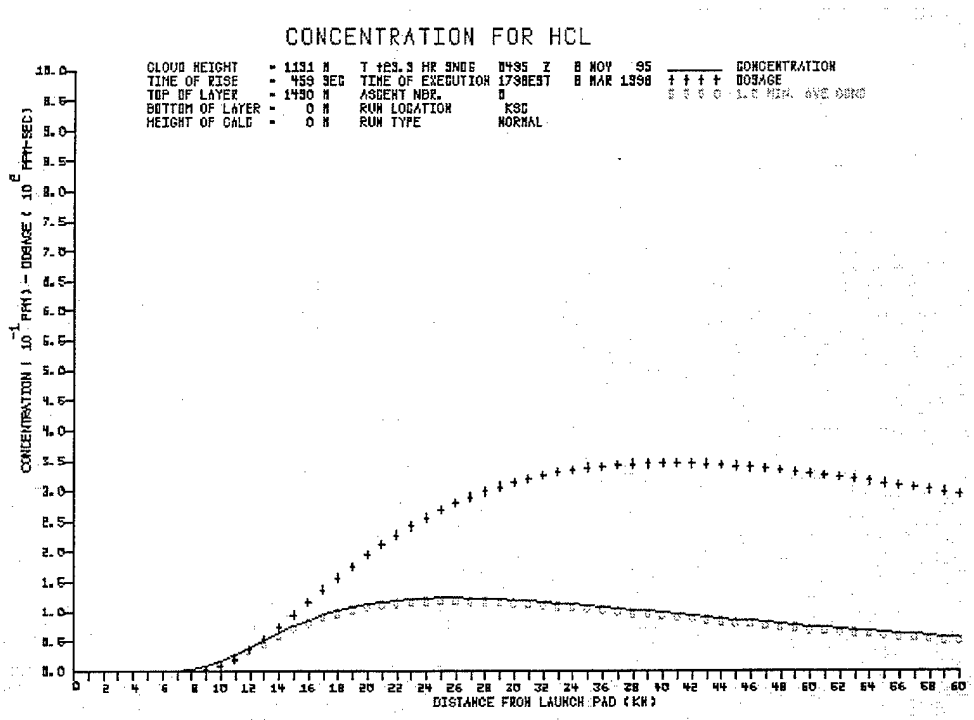

Figure 4: REEDM's Surface Impact Prediction for Cloud Concentrations using T-0.7h Rawinsonde Data

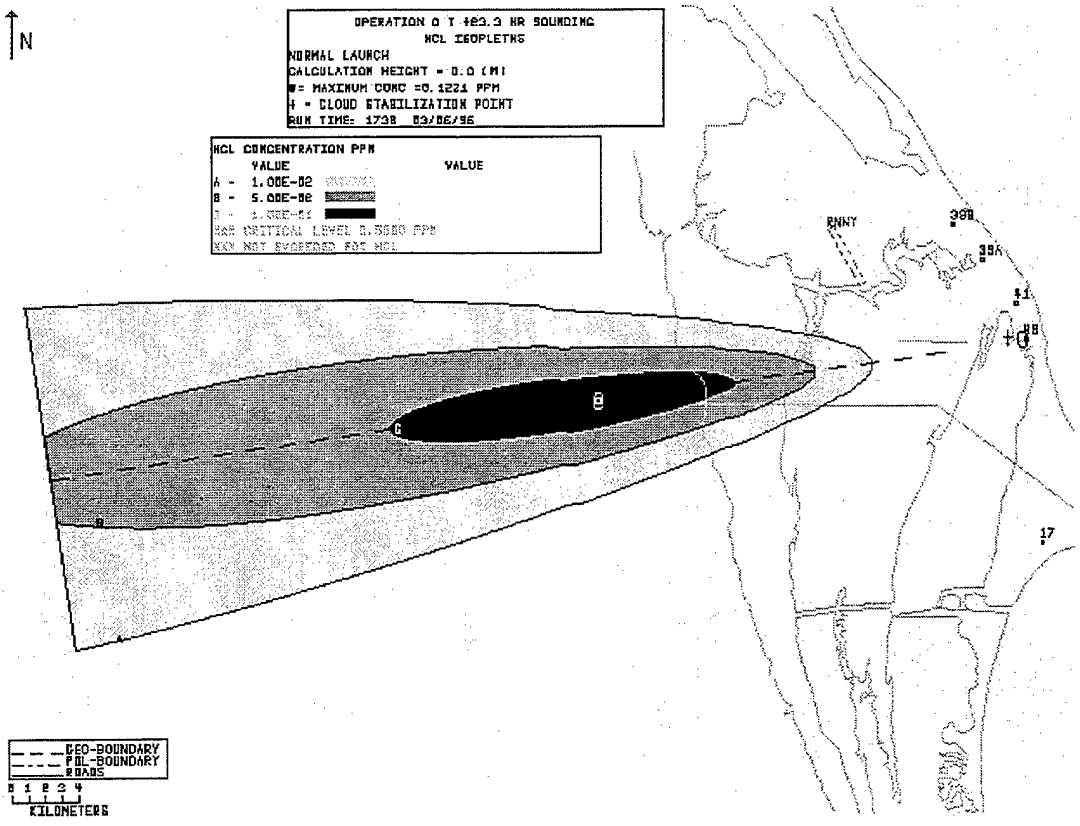

Figure 5: REEDM's Surface Impact Prediction for Cloud Isopleths Using T-0.7h Rawinsonde Data

1. Cloud Stabilization Heights Calculated from T– 0.7 Hour Rawinsonde Data

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1*************************************************************************
                ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM        PAGE   2
                          VERSION 7.05 AT  KSC
                          1802 EST  6 MAR 1996
                      launch time:  0015 EST 06 NOV 1995
     RAWINSONDE ASCENT NUMBER      0, 0435   Z  6 NOV   95  T +23.3 HR
 *************************************************************************

                          ----- PROGRAM OPTIONS -----

 MODEL                                                          CONCENTRATION
 RUN TYPE                                                        OPERATIONAL
 WIND-FIELD TERRAIN EFFECTS MODEL                                       NONE
 LAUNCH VEHICLE                                                    TITAN IV
 LAUNCH TYPE                                                         NORMAL
 LAUNCH COMPLEX NUMBER                                                   40
 TURBULENCE PARAMETERS ARE DETERMINED FROM                 CLIMATOLOGICAL DATA
 SPECIES                                                               HCL
 CLOUD SHAPE                                                     ELLIPTICAL
 CALCULATION HEIGHT                                          STABILIZATION
 PROPELLANT TEMPERATURE (DEG. C)                                     22.86
 CONCENTRATION AVERAGING TIME (SEC.)                                 60.00
 DECAY COEFFICIENT                                                  0.0000
 ABSORPTION COEFFICIENT (RNG- 0 TO 1,NO ABSORPTION=0)               0.0000
 DIFFUSION COEFFICIENTS                                  LATERAL    1.0000
                                                         VERTICAL   1.0000
 VEHICLE AIR ENTRAINMENT PARAMETER                       GAMMAE     0.6400
 DOWNWIND EXPANSION DISTANCE (METERS)                    LATERAL    100.00
                                                         VERTICAL   100.00

                          ----- DATA FILES -----

                                INPUT FILES

 RAWINSONDE FILE                                            k21_0435.raw
 DATA BASE FILE                                              rdmbase.ksc

                                OUTPUT FILES

 PRINT FILE                                                 k21d0435.t_r
 PLOT FILE                                                  k21d0345.ptr
```

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 3
VERSION 7.05 AT KSC
1802 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- METEOROLOGICAL RAWINSONDE DATA -----

HCL CONCENTRATION
RAWINSONDE MSS/MSS
TIME- 0435 Z DATE- 06 NOV 95
ASCENT NUMBER 0

----- T +23.3 HR SOUNDING -----

MET. LEV. NO.	ALTITUDE MSL (FT)	ALTITUDE GND (FT)	GND (M)	WIND DIR (DEG)	WIND SPEED (M/S)	WIND SPEED (KTS)	AIR TEMP (DEG C)	AIR PTEMP (DEG C)	AIR DPTEMP (DEG C)	AIR PRESS (MB)	AIR RH (%)	H M INTERP
1	16	0.0	0.0	20	1.5	3.0	17.3	17.3	15.0	1021.8	86.0	
2	65	49.0	14.9	32	2.1	4.0	18.7	19.0	15.9	1020.0	84.0	**
3	114	98.0	29.9	45	2.6	5.0	20.0	20.6	16.9	1018.3	81.8	**
4	163	147.0	44.8	57	3.1	6.0	21.4	22.3	17.8	1016.5	79.7	**
5	212	196.0	59.7	69	3.6	7.0	22.8	24.0	18.7	1014.8	78.0	
6	317	300.7	91.7	70	3.6	7.0	22.5	23.9	18.1	1011.1	76.2	**
7	421	405.5	123.6	71	3.6	7.0	22.2	23.8	17.5	1007.4	74.7	**
8	526	510.2	155.5	72	3.6	7.0	21.9	23.7	16.9	1003.7	73.3	**
9	631	615.0	187.5	73	3.6	7.0	21.6	23.7	16.3	1000.0	72.0	
10	816	799.5	243.7	74	3.7	7.1	21.1	23.7	15.9	993.6	72.5	**
11	1000	984.0	299.9	74	3.7	7.2	20.6	23.7	15.6	987.2	73.0	
12	1333	1317.3	401.5	77	3.5	6.7	19.5	23.6	15.2	975.6	76.3	**
13	1667	1650.7	503.1	79	3.2	6.3	18.5	23.5	14.9	964.2	79.6	**
14	2000	1984.0	604.7	82	3.0	5.8	17.4	23.4	14.5	952.9	83.0	
15	2083	2067.0	630.0	84	3.1	6.0	17.1	23.4	14.5	950.0	85.0	
16	2261	2245.0	684.3	87	2.6	5.0	16.5	23.3	14.5	944.1	88.0	
17	2832	2816.0	858.3	106	2.1	4.0	15.0	23.5	14.3	925.0	96.0	
18	3000	2984.0	909.5	115	1.9	3.6	14.4	23.3	13.7	919.5	95.0	
19	3219	3203.0	976.3	131	1.5	3.0	13.7	23.2	12.9	912.3	95.0	
20	3589	3573.0	1089.1	149	1.0	2.0	12.9	23.5	12.0	900.0	95.0	
21	3786	3770.0	1149.1	166	1.0	2.0	12.5	23.6	11.6	893.8	94.0	
22	3857	3841.3	1170.8	186	1.0	2.0	12.3	23.6	11.5	891.5	94.5	**
23	3929	3912.7	1192.6	205	1.0	2.0	12.2	23.7	11.3	889.2	94.7	**
24	4000	3984.0	1214.3	225	1.0	1.9	12.0	23.7	11.2	886.9	95.0	
25	4091	4074.5	1241.9	241	1.0	2.0	11.8	23.8	11.0	884.0	95.1	**
26	4271	4255.5	1297.1	274	1.0	2.0	11.4	23.9	10.7	878.2	95.4	**
27	4907	4891.0	1490.8	304	3.6	7.0	11.4	25.2	2.1	858.2	53.0	*
28	5161	5145.0	1568.2	303	5.1	10.0	11.7	26.1	-2.4	850.0	39.0	
29	6000	5984.0	1823.9	298	8.4	16.3	11.0	27.7	-7.1	824.7	27.0	
30	6819	6803.0	2073.6	290	10.3	20.0	9.7	28.9	-9.2	800.0	26.0	
31	7195	7179.0	2188.2	287	10.8	21.0	9.4	29.7	-11.8	789.4	21.0	
32	8000	7984.0	2433.5	284	11.9	23.2	7.5	30.9	1.7	766.3	67.0	
33	8569	8553.0	2607.0	283	12.3	24.0	7.0	32.4	3.5	750.0	78.0	
34	9500	9484.0	2890.7	285	12.9	25.0	5.9	34.1	1.8	725.0	75.3	**

* - INDICATES THE CALCULATED TOP OF THE SURFACE MIXING LAYER
** - INDICATES THAT DATA IS LINEARLY INTERPOLATED FROM INPUT METEOROLOGY

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 4
VERSION 7.05 AT KSC
1802 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

****

----- METEOROLOGICAL RAWINSONDE DATA -----

SURFACE AIR DENSITY (GM/M**3)	1217.84
DEFAULT CALCULATED MIXING LAYER HEIGHT (M)	1490.78
CLOUD COVER IN TENTHS OF CELESTIAL DOME	0.0
CLOUD CEILING (M)	9999.0

----- PLUME RISE DATA -----

EXHAUST RATE OF MATERIAL-	(GRAMS/SEC)		4.20183E+06
TOTAL MATERIAL OUTPUT-	(GRAMS)		5.36146E+08
HEAT OUTPUT PER GRAM-	(CALORIES)		1555.5800
VEHICLE RISE TIME PARAMETERS-	(TK=(A*Z**B)+C)	A=	0.8678
		B=	0.4500
		C=	0.0000

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 5
VERSION 7.05 AT KSC
1802 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

****

----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)	CLOUD RISE TIME (SECONDS)	CLOUD RISE RANGE (METERS)	CLOUD RISE BEARING (DEGREES)	STABILIZED CLOUD RANGE (METERS)	STABILIZED CLOUD BEARING (DEGREES)
1	14.9	2.7	2.3	203.8	0.0	0.0
2	29.9	4.3	6.6	209.3	0.0	0.0
3	44.8	5.8	10.4	215.2	0.0	0.0
4	59.7	7.4	14.9	222.0	0.0	0.0
5	91.7	11.0	23.5	232.0	0.0	0.0
6	123.6	15.0	36.8	238.7	0.0	0.0
7	155.5	19.7	52.2	242.3	0.0	0.0
8	187.5	24.9	69.7	244.8	0.0	0.0
9	243.7	35.4	97.9	247.2	0.0	0.0
10	299.9	47.5	139.0	249.0	0.0	0.0
11	401.5	73.0	207.6	250.8	0.0	0.0
12	503.1	103.0	303.2	252.7	1493.7	256.9
13	604.7	136.6	405.1	254.3	1405.0	258.8
14	630.0	145.5	469.3	255.3	1418.9	260.5
15	684.3	165.2	511.6	256.1	1339.4	261.9
16	- 858.3	235.0	620.0	258.5	1125.4	266.7
17	909.5	258.6	711.7	261.7	1072.3	271.9
18	976.3	293.1	755.8	264.0	991.1	274.3
19	1089.1	373.8	814.8	268.4	887.3	273.9
20	1149.1	459.3 *	884.5	276.1	884.5	276.1
21	1170.8	459.3 *	884.5	276.1	884.5	276.1
22	1192.6	459.3 *	884.5	276.1	884.5	276.1
23	1214.3	459.3 *	884.5	276.1	884.5	276.1
24	1241.9	459.3 *	884.5	276.1	884.5	276.1
25	1297.1	459.3 *	884.5	276.1	884.5	276.1
26	1490.8	459.3 *	884.5	276.1	884.5	276.1
27	1568.2	459.3 *	884.5	276.1	884.5	276.1
28	1823.9	459.3 *	884.5	276.1	884.5	276.1
29	2073.6	459.3 *	884.5	276.1	884.5	276.1
30	2188.2	459.3 *	884.5	276.1	884.5	276.1
31	2433.5	459.3 *	884.5	276.1	884.5	276.1
32	2607.0	459.3 *	884.5	276.1	884.5	276.1
33	2890.7	459.3 *	884.5	276.1	884.5	276.1

* - INDICATES CLOUD STABILIZATION TIME WAS USED

----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)		LAYER SOURCE STRENGTH (GRAMS)	CLOUD UPDRAFT VELOCITY (M/S)	CLOUD RADIUS (METERS)	STD. DEVIATION MATERIAL DIST. ALONGWIND (METERS)	CROSSWIND (METERS)
1	14.9		0.00000E+00	8.7	0.0	0.0	0.0
2	29.9		0.00000E+00	9.8	0.0	0.0	0.0
3	44.8		0.00000E+00	9.8	0.0	0.0	0.0
4	59.7		0.00000E+00	9.4	0.0	0.0	0.0
5	91.7		0.00000E+00	8.4	0.0	0.0	0.0
6	123.6		0.00000E+00	7.4	0.0	0.0	0.0
7	155.5		0.00000E+00	6.5	0.0	0.0	0.0
8	187.5		0.00000E+00	5.8	0.0	0.0	0.0
9	243.7		0.00000E+00	5.0	0.0	0.0	0.0
10	299.9		0.00000E+00	4.4	0.0	0.0	0.0
11	401.5		0.00000E+00	3.6	0.0	0.0	0.0
12	503.1		1.06844E+06	3.2	414.4	193.1	193.1
13	604.7		3.28525E+06	2.9	547.1	254.9	254.9
14	630.0		1.12093E+06	2.8	607.1	282.9	282.9
15	684.3		2.76661E+06	2.7	638.6	297.6	297.6
16	858.3		1.16393E+07	2.3	709.2	330.5	330.5
17	909.5		4.04329E+06	2.1	755.9	352.2	352.2
18	976.3		5.56208E+06	1.8	772.7	360.1	360.1
19	1089.1		9.88005E+06	1.0	789.2	367.7	367.7
20	1149.1	*	5.98042E+06	0.0	795.2	370.5	370.5
21	1170.8	*	2.67736E+06	0.0	794.8	370.3	370.3
22	1192.6	*	2.66346E+06	0.0	793.7	369.8	369.8
23	1214.3	*	2.64624E+06	0.0	792.0	369.0	369.0
24	1241.9	*	3.32732E+06	0.0	789.3	367.8	367.8
25	1297.1	*	6.52839E+06	0.0	783.1	364.9	364.9
26	1490.8	*	2.08640E+07	0.0	750.6	349.8	349.8
27	1568.2	*	7.06809E+06	0.0	688.3	320.7	320.7
28	1823.9	*	1.57085E+07	0.0	559.7	260.8	260.8
29	2073.6	*	6.35449E+06	0.0	199.9	93.2	93.2
30	2188.2	*	2.77609E+06	0.0	199.9	93.2	93.2
31	2433.5	*	5.68592E+06	0.0	199.9	93.2	93.2
32	2607.0	*	3.83085E+06	0.0	199.9	93.2	93.2
33	2890.7	*	5.97701E+06	0.0	199.9	93.2	93.2

* - INDICATES CLOUD STABILIZATION TIME WAS USED

----- CLOUD STABILIZATION -----

CALCULATION HEIGHT	(METERS)	1131.12
STABILIZATION HEIGHT	(METERS)	1131.12
STABILIZATION TIME	(SECS)	459.31
FIRST MIXING LAYER HEIGHT-	(METERS)	TOP = 1490.78
		BASE= 0.00
SECOND SELECTED LAYER HEIGHT-	(METERS)	TOP = 2890.72
		BASE= 1490.78
SIGMAR(AZ) AT THE SURFACE	(DEGREES)	4.8872
SIGMER(EL) AT THE SURFACE	(DEGREES)	4.1906

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
1	1.89	0.51	26.13	12.25	3.6866	3.1611
2	2.31	0.51	38.38	12.25	2.2883	1.9621
3	2.83	0.51	50.63	12.25	1.9897	1.7061
4	3.34	0.51	62.88	12.25	1.8234	1.5635
5	3.60	0.00	69.50	1.00	1.6687	1.4308
6	3.60	0.00	70.50	1.00	1.5539	1.3351
7	3.60	0.00	71.50	1.00	1.5216	1.3122
8	3.60	0.00	72.50	1.00	1.5053	1.3033
9	3.63	0.05	73.25	0.50	1.4837	1.2916
10	3.68	0.05	73.75	0.50	1.4547	1.2758
11	3.58	0.24	75.33	2.67	1.4159	1.2547
12	3.34	0.24	78.00	2.67	1.3723	1.2309
13	3.10	0.24	80.67	2.67	1.3368	1.2116
14	3.04	0.10	83.00	2.00	1.3146	1.1996
15	2.83	0.51	85.50	3.00	1.2816	1.1816
16	2.31	-0.51	96.50	19.00	1.2329	1.1551
17	1.95	0.21	110.50	9.00	1.1960	1.1350
18	1.70	0.31	123.00	16.00	1.1641	1.1176
19	1.29	-0.51	140.00	18.00	1.1262	1.0970
20	1.03	0.00	157.50	17.00	1.0989	1.0821
21	1.02	-0.01	175.83	19.67	1.0854	1.0748
22	1.01	-0.01	195.50	19.67	1.0761	1.0697
23	1.00	-0.01	215.17	19.67	1.0664	1.0643
24	1.00	0.01	233.13	16.25	1.0566	1.0566
25	1.01	0.01	257.50	32.50	1.0372	1.0372
26	2.31	2.58	288.88	30.25	1.0113	1.0113
27	4.37	1.54	303.50	-1.00	1.0000	1.0000
28	6.76	3.24	300.50	-5.00	1.0000	1.0000
29	9.34	1.90	294.00	-8.00	1.0000	1.0000
30	10.55	0.51	288.50	-3.00	1.0000	1.0000

----- CALCULATED METEOROLOGICAL LAYER PARAMETERS -----

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
31	11.37	1.13	285.50	-3.00	1.0000	1.0000
32	12.14	0.41	283.50	-1.00	1.0000	1.0000
33	12.60	0.51	284.00	2.00	1.0000	1.0000

TRANSITION LAYER NUMBER- 1

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	1490.78	298.30	3.60		304.00		1.0000	1.0000
LAYER-			1.60	1.42	81.63	23.24	1.2942	1.1968
BOTTOM-	0.00	290.48	1.54		20.00		4.8872	4.1906

TRANSITION LAYER NUMBER- 2

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	2890.72	307.25	12.86		285.00		1.0000	1.0000
LAYER-			10.00	2.09	288.75	3.97	1.0000	1.0000
BOTTOM-	1490.78	298.30	3.60		304.00		1.0000	1.0000

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 9
VERSION 7.05 AT KSC
1802 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 1131.1 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	PEAK CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
1000.013	274.347	16.466	0.000	22.506
2000.000	267.950	15.467	10.297	39.787
3000.000	265.837	13.313	12.005	56.968
4000.000	264.783	11.007	18.877	74.397
5000.000	264.151	8.977	17.769	92.047
6000.000	263.730	7.310	20.707	109.881
7000.000	263.429	5.981	25.180	127.865
8000.000	263.204	4.930	29.625	145.967
9000.000	263.028	4.100	34.052	164.164
10000.000	262.888	3.441	38.466	182.436
11000.000	262.773	2.914	42.871	200.767
12000.000	262.677	2.489	47.269	219.147
13000.000	262.597	2.142	51.662	237.566
14000.000	262.527	1.857	56.050	256.017
15000.000	262.467	1.620	60.435	274.495
16000.000	262.414	1.422	64.818	292.995
17000.000	262.368	1.254	69.198	311.514
18000.000	262.327	1.112	73.576	330.049
19000.000	262.290	0.991	77.954	348.597
20000.000	262.257	0.886	82.329	367.157
21000.000	262.227	0.796	86.704	385.727
22000.000	262.199	0.718	91.078	404.306
23000.000	262.174	0.649	95.451	422.893
24000.000	262.151	0.589	99.823	441.486
25000.971	262.130	0.536	104.199	460.103
26000.934	262.111	0.489	108.570	478.707
27000.898	262.093	0.447	112.941	497.316
28000.867	262.076	0.410	117.311	515.929
29000.838	262.061	0.377	121.681	534.546
30000.809	262.046	0.348	126.050	553.166
31000.783	262.033	0.321	130.419	571.790
32000.758	262.020	0.297	134.788	590.416
33000.734	262.008	0.276	139.157	609.045
34000.715	261.997	0.256	143.525	627.676
35000.695	261.986	0.239	147.894	646.310
36000.676	261.976	0.223	152.262	664.945
37000.656	261.967	0.208	156.630	683.583

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 10
VERSION 7.05 AT KSC
1802 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 1131.1 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	PEAK CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
38000.641	261.958	0.195	160.997	702.222
39000.621	261.949	0.183	165.365	720.862
40000.605	261.941	0.172	169.732	739.504
41000.594	261.933	0.162	174.100	758.148
42000.578	261.926	0.152	178.467	776.793
43000.566	261.919	0.144	182.834	795.438
44000.551	261.912	0.136	187.201	814.085
45000.539	261.906	0.129	191.568	832.733
46000.527	261.900	0.122	195.935	851.382
47000.516	261.894	0.116	200.302	870.032
48000.504	261.888	0.110	204.669	888.682
49000.496	261.883	0.105	209.035	907.334
50000.484	261.878	0.100	213.402	925.986
51000.477	261.873	0.096	217.768	944.638
52000.469	261.868	0.092	222.135	963.292
53000.457	261.864	0.088	226.501	981.946
54000.449	261.859	0.084	230.868	1000.600
55000.441	261.855	0.081	235.234	1019.256
56000.434	261.851	0.077	239.600	1037.911
57000.426	261.847	0.074	243.967	1056.567
58000.418	261.843	0.072	248.333	1075.224
59000.410	261.839	0.069	252.699	1093.881
60000.406	261.836	0.066	257.065	1112.538

	RANGE	BEARING
16.466 IS THE MAXIMUM PEAK CONCENTRATION	1000.0	274.3

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 1131.1 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	TOTAL DOSAGE (PPM SEC)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
1000.013	274.347	9583.242	0.000	22.506
2000.000	267.950	9135.047	10.297	39.787
3000.000	265.837	8149.665	12.005	56.968
4000.000	264.783	7106.309	18.877	74.397
5000.000	264.151	6184.906	17.769	92.047
6000.000	263.730	5413.508	20.707	109.881
7000.000	263.429	4777.329	25.180	127.865
8000.000	263.204	4252.428	29.625	145.967
9000.000	263.028	3816.167	34.052	164.164
10000.000	262.888	3449.958	38.466	182.436
11000.000	262.773	3139.221	42.871	200.767
12000.000	262.677	2872.659	47.269	219.147
13000.000	262.597	2641.581	51.662	237.566
14000.000	262.527	2439.324	56.050	256.017
15000.000	262.467	2260.783	60.435	274.495
16000.000	262.414	2102.020	64.818	292.995
17000.000	262.368	1959.956	69.198	311.514
18000.000	262.327	1832.151	73.576	330.049
19000.000	262.290	1716.633	77.954	348.597
20000.000	262.257	1611.787	82.329	367.157
21000.000	262.227	1516.276	86.704	385.727
22000.000	262.199	1428.978	91.078	404.306
23000.000	262.174	1348.947	95.451	422.893
24000.000	262.151	1275.380	99.823	441.486
25000.971	262.130	1207.531	104.199	460.103
26000.934	262.111	1144.944	108.570	478.707
27000.898	262.093	1087.042	112.941	497.316
28000.867	262.076	1033.387	117.311	515.929
29000.838	262.061	983.594	121.681	534.546
30000.809	262.046	937.326	126.050	553.166
31000.783	262.033	894.286	130.419	571.790
32000.758	262.020	854.209	134.788	590.416
33000.734	262.008	816.859	139.157	609.045
34000.715	261.997	782.023	143.525	627.676
35000.695	261.986	749.508	147.894	646.310
36000.676	261.976	719.141	152.262	664.945
37000.656	261.967	690.761	156.630	683.583

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 1131.1 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	TOTAL DOSAGE (PPM SEC)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
38000.641	261.958	664.223	160.997	702.222
39000.621	261.949	639.402	165.365	720.862
40000.605	261.941	616.163	169.732	739.504
41000.594	261.933	594.399	174.100	758.148
42000.578	261.926	574.007	178.467	776.793
43000.566	261.919	554.888	182.834	795.438
44000.551	261.912	536.953	187.201	814.085
45000.539	261.906	520.117	191.568	832.733
46000.527	261.900	504.305	195.935	851.382
47000.516	261.894	489.440	200.302	870.032
48000.504	261.888	475.458	204.669	888.682
49000.496	261.883	462.298	209.035	907.334
50000.484	261.878	449.901	213.402	925.986
51000.477	261.873	438.212	217.768	944.638
52000.469	261.868	427.180	222.135	963.292
53000.457	261.864	416.760	226.501	981.946
54000.449	261.859	406.907	230.868	1000.600
55000.441	261.855	397.582	235.234	1019.256
56000.434	261.851	388.746	239.600	1037.911
57000.426	261.847	380.365	243.967	1056.567
58000.418	261.843	372.407	248.333	1075.224
59000.410	261.839	364.841	252.699	1093.881
60000.406	261.836	357.639	257.065	1112.538

	RANGE	BEARING
9583.242 IS THE MAXIMUM TOTAL DOSAGE	1000.0	274.3

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 13
VERSION 7.05 AT KSC
1802 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 1131.1 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	1.0 MIN. MEAN CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
1000.013	274.347	16.420	0.000	22.506
2000.000	267.950	15.425	10.297	39.787
3000.000	265.837	13.279	12.005	56.968
4000.000	264.783	10.982	18.877	74.397
5000.000	264.151	8.959	17.769	92.047
6000.000	263.730	7.298	20.707	109.881
7000.000	263.429	5.972	25.180	127.865
8000.000	263.204	4.924	29.625	145.967
9000.000	263.028	4.096	34.052	164.164
10000.000	262.888	3.438	38.466	182.436
11000.000	262.773	2.912	42.871	200.767
12000.000	262.677	2.487	47.269	219.147
13000.000	262.597	2.141	51.662	237.566
14000.000	262.527	1.856	56.050	256.017
15000.000	262.467	1.619	60.435	274.495
16000.000	262.414	1.421	64.818	292.995
17000.000	262.368	1.254	69.198	311.514
18000.000	262.327	1.112	73.576	330.049
19000.000	262.290	0.990	77.954	348.597
20000.000	262.257	0.886	82.329	367.157
21000.000	262.227	0.796	86.704	385.727
22000.000	262.199	0.717	91.078	404.306
23000.000	262.174	0.649	95.451	422.893
24000.000	262.151	0.589	99.823	441.486
25000.971	262.130	0.536	104.199	460.103
26000.934	262.111	0.489	108.570	478.707
27000.898	262.093	0.447	112.941	497.316
28000.867	262.076	0.410	117.311	515.929
29000.838	262.061	0.377	121.681	534.546
30000.809	262.046	0.348	126.050	553.166
31000.783	262.033	0.321	130.419	571.790
32000.758	262.020	0.297	134.788	590.416
33000.734	262.008	0.276	139.157	609.045
34000.715	261.997	0.256	143.525	627.676
35000.695	261.986	0.239	147.894	646.310
36000.676	261.976	0.223	152.262	664.945

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 14
VERSION 7.05 AT KSC
1802 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 1131.1 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	1.0 MIN. MEAN CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
37000.656	261.967	0.208	156.630	683.583
38000.641	261.958	0.195	160.997	702.222
39000.621	261.949	0.183	165.365	720.862
40000.605	261.941	0.172	169.732	739.504
41000.594	261.933	0.162	174.100	758.148
42000.578	261.926	0.152	178.467	776.793
43000.566	261.919	0.144	182.834	795.438
44000.551	261.912	0.136	187.201	814.085
45000.539	261.906	0.129	191.568	832.733
46000.527	261.900	0.122	195.935	851.382
47000.516	261.894	0.116	200.302	870.032
48000.504	261.888	0.110	204.669	888.682
49000.496	261.883	0.105	209.035	907.334
50000.484	261.878	0.100	213.402	925.986
51000.477	261.873	0.096	217.768	944.638
52000.469	261.868	0.092	222.135	963.292
53000.457	261.864	0.088	226.501	981.946
54000.449	261.859	0.084	230.868	1000.600
55000.441	261.855	0.081	235.234	1019.256
56000.434	261.851	0.077	239.600	1037.911
57000.426	261.847	0.074	243.967	1056.567
58000.418	261.843	0.072	248.333	1075.224
59000.410	261.839	0.069	252.699	1093.881
60000.406	261.836	0.066	257.065	1112.538

	RANGE	BEARING
16.420 IS THE MAXIMUM 1.0 MIN. MEAN CONCENTRATION	1000.0	274.3

*** REEDM HAS TERMINATED

2. Ground-Level HCl Exposure Doses Calculated from T– 0.7 Hour Rawinsonde Data

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                ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM          PAGE   2
                          VERSION 7.05 AT  KSC
                          1738 EST  6 MAR 1996
                      launch time:  0015 EST 06 NOV 1995
     RAWINSONDE ASCENT NUMBER      0, 0435    Z  6 NOV   95  T +23.3 HR
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                          ----- PROGRAM OPTIONS -----

 MODEL                                                              CONCENTRATION
 RUN TYPE                                                            OPERATIONAL
 WIND-FIELD TERRAIN EFFECTS MODEL                                           NONE
 LAUNCH VEHICLE                                                      TITAN IV
 LAUNCH TYPE                                                           NORMAL
 LAUNCH COMPLEX NUMBER                                                     40
 TURBULENCE PARAMETERS ARE DETERMINED FROM                  CLIMATOLOGICAL DATA
 SPECIES                                                                  HCL
 CLOUD SHAPE                                                       ELLIPTICAL
 CALCULATION HEIGHT                                                   SURFACE
 PROPELLANT TEMPERATURE (DEG. C)                                        22.86
 CONCENTRATION AVERAGING TIME (SEC.)                                    60.00
 DECAY COEFFICIENT                                                      0.0000
 ABSORPTION COEFFICIENT (RNG- 0 TO 1,NO ABSORPTION=0)                   0.0000
 DIFFUSION COEFFICIENTS                                    LATERAL      1.0000
                                                           VERTICAL     1.0000
 VEHICLE AIR ENTRAINMENT PARAMETER                         GAMMAE       0.6400
 DOWNWIND EXPANSION DISTANCE (METERS)                      LATERAL      100.00
                                                           VERTICAL     100.00

                          ----- DATA FILES -----

                                INPUT FILES

 RAWINSONDE FILE                                                  k21_0435.raw
 DATA BASE FILE                                                    rdmbase.ksc

                                OUTPUT FILES

 PRINT FILE                                                       k21d0435.u_r
 PLOT FILE                                                        k21d0435.pur
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----- METEOROLOGICAL RAWINSONDE DATA -----

HCL CONCENTRATION
RAWINSONDE MSS/MSS
TIME- 0435 Z DATE- 06 NOV 95
ASCENT NUMBER 0

----- T +23.3 HR SOUNDING -----

MET. LEV. NO.	ALTITUDE MSL (FT)	ALTITUDE GND (FT)	GND (M)	WIND DIR (DEG)	WIND SPEED (M/S)	WIND SPEED (KTS)	AIR TEMP (DEG C)	AIR PTEMP (DEG C)	AIR DPTEMP (DEG C)	AIR PRESS (MB)	AIR RH (%)	H M	INT-ERP
1	16	0.0	0.0	20	1.5	3.0	17.3	17.3	15.0	1021.8	86.0		
2	65	49.0	14.9	32	2.1	4.0	18.7	19.0	15.9	1020.0	84.0		**
3	114	98.0	29.9	45	2.6	5.0	20.0	20.6	16.9	1018.3	81.8		**
4	163	147.0	44.8	57	3.1	6.0	21.4	22.3	17.8	1016.5	79.7		**
5	212	196.0	59.7	69	3.6	7.0	22.8	24.0	18.7	1014.8	78.0		
6	317	300.7	91.7	70	3.6	7.0	22.5	23.9	18.1	1011.1	76.2		**
7	421	405.5	123.6	71	3.6	7.0	22.2	23.8	17.5	1007.4	74.7		**
8	526	510.2	155.5	72	3.6	7.0	21.9	23.7	16.9	1003.7	73.3		**
9	631	615.0	187.5	73	3.6	7.0	21.6	23.7	16.3	1000.0	72.0		
10	816	799.5	243.7	74	3.7	7.1	21.1	23.7	15.9	993.6	72.5		**
11	1000	984.0	299.9	74	3.7	7.2	20.6	23.7	15.6	987.2	73.0		
12	1333	1317.3	401.5	77	3.5	6.7	19.5	23.6	15.2	975.6	76.3		**
13	1667	1650.7	503.1	79	3.2	6.3	18.5	23.5	14.9	964.2	79.6		**
14	2000	1984.0	604.7	82	3.0	5.8	17.4	23.4	14.5	952.9	83.0		
15	2083	2067.0	630.0	84	3.1	6.0	17.1	23.4	14.5	950.0	85.0		
16	2261	2245.0	684.3	87	2.6	5.0	16.5	23.3	14.5	944.1	88.0		
17	2832	2816.0	858.3	106	2.1	4.0	15.0	23.5	14.3	925.0	96.0		
18	3000	2984.0	909.5	115	1.9	3.6	14.4	23.3	13.7	919.5	95.0		
19	3219	3203.0	976.3	131	1.5	3.0	13.7	23.2	12.9	912.3	95.0		
20	3589	3573.0	1089.1	149	1.0	2.0	12.9	23.5	12.0	900.0	95.0		
21	3786	3770.0	1149.1	166	1.0	2.0	12.5	23.6	11.6	893.8	94.0		
22	3857	3841.3	1170.8	186	1.0	2.0	12.3	23.6	11.5	891.5	94.5		**
23	3929	3912.7	1192.6	205	1.0	2.0	12.2	23.7	11.3	889.2	94.7		**
24	4000	3984.0	1214.3	225	1.0	1.9	12.0	23.7	11.2	886.9	95.0		
25	4091	4074.5	1241.9	241	1.0	2.0	11.8	23.8	11.0	884.0	95.1		**
26	4271	4255.5	1297.1	274	1.0	2.0	11.4	23.9	10.7	878.2	95.4		**
27	4907	4891.0	1490.8	304	3.6	7.0	11.4	25.2	2.1	858.2	53.0	*	
28	5161	5145.0	1568.2	303	5.1	10.0	11.7	26.1	-2.4	850.0	39.0		
29	6000	5984.0	1823.9	298	8.4	16.3	11.0	27.7	-7.1	824.7	27.0		
30	6819	6803.0	2073.6	290	10.3	20.0	9.7	28.9	-9.2	800.0	26.0		
31	7195	7179.0	2188.2	287	10.8	21.0	9.4	29.7	-11.8	789.4	21.0		
32	8000	7984.0	2433.5	284	11.9	23.2	7.5	30.9	1.7	766.3	67.0		
33	8569	8553.0	2607.0	283	12.3	24.0	7.0	32.4	3.5	750.0	78.0		
34	9500	9484.0	2890.7	285	12.9	25.0	5.9	34.1	1.8	725.0	75.3		**

* - INDICATES THE CALCULATED TOP OF THE SURFACE MIXING LAYER
** - INDICATES THAT DATA IS LINEARLY INTERPOLATED FROM INPUT METEOROLOGY

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 4
VERSION 7.05 AT KSC
1738 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- METEOROLOGICAL RAWINSONDE DATA -----

SURFACE AIR DENSITY (GM/M**3)	1217.84
DEFAULT CALCULATED MIXING LAYER HEIGHT (M)	1490.78
CLOUD COVER IN TENTHS OF CELESTIAL DOME	0.0
CLOUD CEILING (M)	9999.0

----- PLUME RISE DATA -----

EXHAUST RATE OF MATERIAL-	(GRAMS/SEC)		4.20183E+06
TOTAL MATERIAL OUTPUT-	(GRAMS)		5.36146E+08
HEAT OUTPUT PER GRAM-	(CALORIES)		1555.5800
VEHICLE RISE TIME PARAMETERS-	(TK=(A*Z**B)+C)	A=	0.8678
		B=	0.4500
		C=	0.0000

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 5
VERSION 7.05 AT KSC
1738 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)	CLOUD RISE TIME (SECONDS)	CLOUD RISE RANGE (METERS)	CLOUD RISE BEARING (DEGREES)	STABILIZED CLOUD RANGE (METERS)	STABILIZED CLOUD BEARING (DEGREES)
1	14.9	2.7	2.3	203.8	0.0	0.0
2	29.9	4.3	6.6	209.3	0.0	0.0
3	44.8	5.8	10.4	215.2	0.0	0.0
4	59.7	7.4	14.9	222.0	0.0	0.0
5	91.7	11.0	23.5	232.0	0.0	0.0
6	123.6	15.0	36.8	238.7	0.0	0.0
7	155.5	19.7	52.2	242.3	0.0	0.0
8	187.5	24.9	69.7	244.8	0.0	0.0
9	243.7	35.4	97.9	247.2	0.0	0.0
10	299.9	47.5	139.0	249.0	0.0	0.0
11	401.5	73.0	207.6	250.8	0.0	0.0
12	503.1	103.0	303.2	252.7	1493.7	256.9
13	604.7	136.6	405.1	254.3	1405.0	258.8
14	630.0	145.5	469.3	255.3	1418.9	260.5
15	684.3	165.2	511.6	256.1	1339.4	261.9
16	858.3	235.0	620.0	258.5	1125.4	266.7
17	909.5	258.6	711.7	261.7	1072.3	271.9
18	976.3	293.1	755.8	264.0	991.1	274.3
19	1089.1	373.8	814.8	268.4	887.3	273.9
20	1149.1	459.3 *	884.5	276.1	884.5	276.1
21	1170.8	459.3 *	884.5	276.1	884.5	276.1
22	1192.6	459.3 *	884.5	276.1	884.5	276.1
23	1214.3	459.3 *	884.5	276.1	884.5	276.1
24	1241.9	459.3 *	884.5	276.1	884.5	276.1
25	1297.1	459.3 *	884.5	276.1	884.5	276.1
26	1490.8	459.3 *	884.5	276.1	884.5	276.1
27	1568.2	459.3 *	884.5	276.1	884.5	276.1
28	1823.9	459.3 *	884.5	276.1	884.5	276.1
29	2073.6	459.3 *	884.5	276.1	884.5	276.1
30	2188.2	459.3 *	884.5	276.1	884.5	276.1
31	2433.5	459.3 *	884.5	276.1	884.5	276.1
32	2607.0	459.3 *	884.5	276.1	884.5	276.1
33	2890.7	459.3 *	884.5	276.1	884.5	276.1

* - INDICATES CLOUD STABILIZATION TIME WAS USED

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 6
VERSION 7.05 AT KSC
1738 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)		LAYER SOURCE STRENGTH (GRAMS)	CLOUD UPDRAFT VELOCITY (M/S)	CLOUD RADIUS (METERS)	STD. DEVIATION MATERIAL DIST. ALONGWIND (METERS)	CROSSWIND (METERS)
1	14.9		0.00000E+00	8.7	0.0	0.0	0.0
2	29.9		0.00000E+00	9.8	0.0	0.0	0.0
3	44.8		0.00000E+00	9.8	0.0	0.0	0.0
4	59.7		0.00000E+00	9.4	0.0	0.0	0.0
5	91.7		0.00000E+00	8.4	0.0	0.0	0.0
6	123.6		0.00000E+00	7.4	0.0	0.0	0.0
7	155.5		0.00000E+00	6.5	0.0	0.0	0.0
8	187.5		0.00000E+00	5.8	0.0	0.0	0.0
9	243.7		0.00000E+00	5.0	0.0	0.0	0.0
10	299.9		0.00000E+00	4.4	0.0	0.0	0.0
11	401.5		0.00000E+00	3.6	0.0	0.0	0.0
12	503.1		1.06844E+06	3.2	414.4	193.1	193.1
13	604.7		3.28525E+06	2.9	547.1	254.9	254.9
14	630.0		1.12093E+06	2.8	607.1	282.9	282.9
15	684.3		2.76661E+06	2.7	638.6	297.6	297.6
16	858.3		1.16393E+07	2.3	709.2	330.5	330.5
17	909.5		4.04329E+06	2.1	755.9	352.2	352.2
18	976.3		5.56208E+06	1.8	772.7	360.1	360.1
19	1089.1		9.88005E+06	1.0	789.2	367.7	367.7
20	1149.1	*	5.98042E+06	0.0	795.2	370.5	370.5
21	1170.8	*	2.67736E+06	0.0	794.8	370.3	370.3
22	1192.6	*	2.66346E+06	0.0	793.7	369.8	369.8
23	1214.3	*	2.64624E+06	0.0	792.0	369.0	369.0
24	1241.9	*	3.32732E+06	0.0	789.3	367.8	367.8
25	1297.1	*	6.52839E+06	0.0	783.1	364.9	364.9
26	1490.8	*	2.08640E+07	0.0	750.6	349.8	349.8
27	1568.2	*	7.06809E+06	0.0	688.3	320.7	320.7
28	1823.9	*	1.57085E+07	0.0	559.7	260.8	260.8
29	2073.6	*	6.35449E+06	0.0	199.9	93.2	93.2
30	2188.2	*	2.77609E+06	0.0	199.9	93.2	93.2
31	2433.5	*	5.68592E+06	0.0	199.9	93.2	93.2
32	2607.0	*	3.83085E+06	0.0	199.9	93.2	93.2
33	2890.7	*	5.97701E+06	0.0	199.9	93.2	93.2

* - INDICATES CLOUD STABILIZATION TIME WAS USED

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 7
VERSION 7.05 AT KSC
1738 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- CLOUD STABILIZATION -----

CALCULATION HEIGHT	(METERS)	0.00
STABILIZATION HEIGHT	(METERS)	1131.12
STABILIZATION TIME	(SECS)	459.31
FIRST MIXING LAYER HEIGHT-	(METERS)	TOP = 1490.78
		BASE= 0.00
SECOND SELECTED LAYER HEIGHT-	(METERS)	TOP = 2890.72
		BASE= 1490.78
SIGMAR(AZ) AT THE SURFACE	(DEGREES)	4.8872
SIGMER(EL) AT THE SURFACE	(DEGREES)	4.1906

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
1	1.89	0.51	26.13	12.25	3.6866	3.1611
2	2.31	0.51	38.38	12.25	2.2883	1.9621
3	2.83	0.51	50.63	12.25	1.9897	1.7061
4	3.34	0.51	62.88	12.25	1.8234	1.5635
5	3.60	0.00	69.50	1.00	1.6687	1.4308
6	3.60	0.00	70.50	1.00	1.5539	1.3351
7	3.60	0.00	71.50	1.00	1.5216	1.3122
8	3.60	0.00	72.50	1.00	1.5053	1.3033
9	3.63	0.05	73.25	0.50	1.4837	1.2916
10	3.68	0.05	73.75	0.50	1.4547	1.2758
11	3.58	0.24	75.33	2.67	1.4159	1.2547
12	3.34	0.24	78.00	2.67	1.3723	1.2309
13	3.10	0.24	80.67	2.67	1.3368	1.2116
14	3.04	0.10	83.00	2.00	1.3146	1.1996
15	2.83	0.51	85.50	3.00	1.2816	1.1816
16	2.31	-0.51	96.50	19.00	1.2329	1.1551
17	1.95	0.21	110.50	9.00	1.1960	1.1350
18	1.70	0.31	123.00	16.00	1.1641	1.1176
19	1.29	-0.51	140.00	18.00	1.1262	1.0970
20	1.03	0.00	157.50	17.00	1.0989	1.0821
21	1.02	-0.01	175.83	19.67	1.0854	1.0748
22	1.01	-0.01	195.50	19.67	1.0761	1.0697
23	1.00	-0.01	215.17	19.67	1.0664	1.0643
24	1.00	0.01	233.13	16.25	1.0566	1.0566
25	1.01	0.01	257.50	32.50	1.0372	1.0372
26	2.31	2.58	288.88	30.25	1.0113	1.0113
27	4.37	1.54	303.50	-1.00	1.0000	1.0000
28	6.76	3.24	300.50	-5.00	1.0000	1.0000
29	9.34	1.90	294.00	-8.00	1.0000	1.0000
30	10.55	0.51	288.50	-3.00	1.0000	1.0000

----- CALCULATED METEOROLOGICAL LAYER PARAMETERS -----

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
31	11.37	1.13	285.50	-3.00	1.0000	1.0000
32	12.14	0.41	283.50	-1.00	1.0000	1.0000
33	12.60	0.51	284.00	2.00	1.0000	1.0000

TRANSITION LAYER NUMBER- 1

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	1490.78	298.30	3.60		304.00		1.0000	1.0000
LAYER-			1.60	1.42	81.63	23.24	1.2942	1.1968
BOTTOM-	0.00	290.48	1.54		20.00		4.8872	4.1906

TRANSITION LAYER NUMBER- 2

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	2890.72	307.25	12.86		285.00		1.0000	1.0000
LAYER-			10.00	2.09	288.75	3.97	1.0000	1.0000
BOTTOM-	1490.78	298.30	3.60		304.00		1.0000	1.0000

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 0.0 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	PEAK CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
8000.893	260.769	0.003	29.639	114.056
9000.534	261.001	0.008	34.064	164.052
10000.209	261.255	0.016	38.477	182.480
11000.410	261.130	0.027	42.881	200.808
12000.063	261.439	0.039	47.278	219.184
13000.148	261.352	0.052	51.670	237.601
14000.258	261.277	0.064	56.058	256.049
15000.000	261.631	0.076	60.442	274.525
16000.006	261.575	0.086	64.824	293.024
17000.025	261.526	0.095	69.204	311.541
18000.057	261.483	0.102	73.582	330.074
19000.168	261.867	0.108	77.959	348.621
20000.131	261.833	0.113	82.335	367.180
21000.100	261.802	0.117	86.709	385.749
22000.074	261.774	0.119	91.083	404.327
23000.053	261.748	0.121	95.455	422.912
24000.035	261.724	0.122	99.828	441.505
25000.023	261.703	0.123	104.199	460.103
26000.014	261.683	0.123	108.570	478.707
27000.006	261.664	0.123	112.941	497.316
28000.002	261.647	0.122	117.311	515.929
29000.838	262.061	0.121	121.681	534.546
30000.809	262.046	0.119	126.050	553.166
31000.783	262.033	0.118	130.419	571.790
32000.758	262.020	0.116	134.788	590.416
33000.734	262.008	0.114	139.157	609.045
34000.715	261.997	0.112	143.525	627.676
35000.695	261.986	0.110	147.894	646.310
36000.676	261.976	0.107	152.262	664.945
37000.656	261.967	0.105	156.630	683.583
38000.641	261.958	0.103	160.997	702.222
39000.621	261.949	0.100	165.365	720.862
40000.605	261.941	0.098	169.732	739.504
41000.594	261.933	0.095	174.100	758.148
42000.578	261.926	0.093	178.467	776.793
43000.566	261.919	0.091	182.834	795.438
44000.551	261.912	0.088	187.201	814.085

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 10
VERSION 7.05 AT KSC
1738 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 0.0 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	PEAK CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
45000.539	261.906	0.086	191.568	832.733
46000.527	261.900	0.084	195.935	851.382
47000.516	261.894	0.081	200.302	870.032
48000.504	261.888	0.079	204.669	888.682
49000.496	261.883	0.077	209.035	907.334
50000.484	261.878	0.075	213.402	925.986
51000.477	261.873	0.072	217.768	944.638
52000.469	261.868	0.070	222.135	963.292
53000.457	261.864	0.068	226.501	981.946
54000.449	261.859	0.066	230.868	1000.600
55000.441	261.855	0.064	235.234	1019.256
56000.434	261.851	0.063	239.600	1037.911
57000.426	261.847	0.061	243.967	1056.567
58000.418	261.843	0.059	248.333	1075.224
59000.410	261.839	0.057	252.699	1093.881
60000.406	261.836	0.056	257.065	1112.538

	RANGE	BEARING
0.123 IS THE MAXIMUM PEAK CONCENTRATION	26000.0	261.7

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VERSION 7.05 AT KSC
1738 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 0.0 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	TOTAL DOSAGE (PPM SEC)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
6000.962	260.599	0.014	20.726	45.767
7000.740	260.793	0.290	25.195	64.012
8000.893	260.769	1.792	29.639	114.056
9000.534	261.001	5.910	34.064	164.052
10000.209	261.255	13.670	38.477	182.480
11000.410	261.130	25.369	42.881	200.808
12000.063	261.439	40.616	47.278	219.184
13000.148	261.352	58.642	51.670	237.601
14000.010	261.694	78.479	56.058	256.049
15000.000	261.631	99.416	60.442	274.525
16000.006	261.575	120.612	64.824	293.024
17000.025	261.526	141.520	69.204	311.541
18000.215	261.905	161.756	73.582	330.074
19000.168	261.867	181.235	77.959	348.621
20000.131	261.833	199.632	82.335	367.180
21000.100	261.802	216.853	86.709	385.749
22000.074	261.774	232.854	91.083	404.327
23000.053	261.748	247.626	95.455	422.912
24000.035	261.724	261.185	99.828	441.505
25000.023	261.703	273.562	104.199	460.103
26000.014	261.683	284.797	108.570	478.707
27000.006	261.664	294.937	112.941	497.316
28000.002	261.647	304.034	117.311	515.929
29000.838	262.061	312.156	121.681	534.546
30000.809	262.046	319.396	126.050	553.166
31000.783	262.033	325.742	130.419	571.790
32000.758	262.020	331.243	134.788	590.416
33000.734	262.008	335.949	139.157	609.045
34000.715	261.997	339.907	143.525	627.676
35000.695	261.986	343.162	147.894	646.310
36000.676	261.976	345.759	152.262	664.945
37000.656	261.967	347.740	156.630	683.583
38000.641	261.958	349.145	160.997	702.222
39000.621	261.949	350.016	165.365	720.862
40000.605	261.941	350.389	169.732	739.504
41000.594	261.933	350.301	174.100	758.148
42000.578	261.926	349.788	178.467	776.793

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 12
VERSION 7.05 AT KSC
1738 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 0.0 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	TOTAL DOSAGE (PPM SEC)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
43000.566	261.919	348.883	182.834	795.438
44000.551	261.912	347.619	187.201	814.085
45000.539	261.906	346.028	191.568	832.733
46000.527	261.900	344.139	195.935	851.382
47000.516	261.894	341.981	200.302	870.032
48000.504	261.888	339.581	204.669	888.682
49000.496	261.883	336.965	209.035	907.334
50000.484	261.878	334.156	213.402	925.986
51000.477	261.873	331.179	217.768	944.638
52000.469	261.868	328.064	222.135	963.292
53000.457	261.864	324.816	226.501	981.946
54000.449	261.859	321.463	230.868	1000.600
55000.441	261.855	318.025	235.234	1019.256
56000.434	261.851	314.516	239.600	1037.911
57000.426	261.847	310.944	243.967	1056.567
58000.418	261.843	307.331	248.333	1075.224
59000.410	261.839	303.692	252.699	1093.881
60000.406	261.836	300.030	257.065	1112.538

	RANGE	BEARING
350.389 IS THE MAXIMUM TOTAL DOSAGE	40000.6	261.9

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 0.0 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	1.0 MIN. MEAN CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
8000.893	260.769	0.003	29.639	114.056
9000.534	261.001	0.008	34.064	164.052
10000.209	261.255	0.016	38.477	182.480
11000.410	261.130	0.027	42.881	200.808
12000.063	261.439	0.039	47.278	219.184
13000.148	261.352	0.052	51.670	237.601
14000.258	261.277	0.064	56.058	256.049
15000.000	261.631	0.076	60.442	274.525
16000.006	261.575	0.086	64.824	293.024
17000.025	261.526	0.095	69.204	311.541
18000.057	261.483	0.102	73.582	330.074
19000.168	261.867	0.108	77.959	348.621
20000.131	261.833	0.113	82.335	367.180
21000.100	261.802	0.117	86.709	385.749
22000.074	261.774	0.119	91.083	404.327
23000.053	261.748	0.121	95.455	422.912
24000.035	261.724	0.122	99.828	441.505
25000.023	261.703	0.123	104.199	460.103
26000.014	261.683	0.123	108.570	478.707
27000.006	261.664	0.123	112.941	497.316
28000.002	261.647	0.122	117.311	515.929
29000.838	262.061	0.121	121.681	534.546
30000.809	262.046	0.119	126.050	553.166
31000.783	262.033	0.118	130.419	571.790
32000.758	262.020	0.116	134.788	590.416
33000.734	262.008	0.114	139.157	609.045
34000.715	261.997	0.112	143.525	627.676
35000.695	261.986	0.110	147.894	646.310
36000.676	261.976	0.107	152.262	664.945
37000.656	261.967	0.105	156.630	683.583
38000.641	261.958	0.103	160.997	702.222
39000.621	261.949	0.100	165.365	720.862
40000.605	261.941	0.098	169.732	739.504
41000.594	261.933	0.095	174.100	758.148
42000.578	261.926	0.093	178.467	776.793
43000.566	261.919	0.091	182.834	795.438

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VERSION 7.05 AT KSC
1738 EST 6 MAR 1996
launch time: 0015 EST 06 NOV 1995
RAWINSONDE ASCENT NUMBER 0, 0435 Z 6 NOV 95 T +23.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 0.0 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 1490.8 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	1.0 MIN. MEAN CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
44000.551	261.912	0.088	187.201	814.085
45000.539	261.906	0.086	191.568	832.733
46000.527	261.900	0.084	195.935	851.382
47000.516	261.894	0.081	200.302	870.032
48000.504	261.888	0.079	204.669	888.682
49000.496	261.883	0.077	209.035	907.334
50000.484	261.878	0.075	213.402	925.986
51000.477	261.873	0.072	217.768	944.638
52000.469	261.868	0.070	222.135	963.292
53000.457	261.864	0.068	226.501	981.946
54000.449	261.859	0.066	230.868	1000.600
55000.441	261.855	0.064	235.234	1019.256
56000.434	261.851	0.063	239.600	1037.911
57000.426	261.847	0.061	243.967	1056.567
58000.418	261.843	0.059	248.333	1075.224
59000.410	261.839	0.057	252.699	1093.881
60000.406	261.836	0.056	257.065	1112.538

	RANGE	BEARING
0.123 IS THE MAXIMUM 1.0 MIN. MEAN CONCENTRATION	26000.0	261.7

Appendix D—Rawinsonde Meteorological Data Measured at CCAS Before the #K21 Launch

[Material in this Appendix was contributed by Randy Evans of Ensco, Inc.'s Applied Meteorology Unit and tabulated by Steve Cobb and Jo Ann Kamada of The Aerospace Corporation's Environmental Systems Directorate]

Meteorological tower, rawinsonde, and Doppler radar wind profiler data were measured at CCAS for mission #K21 prior to launch and during development and dispersion of the launch cloud. Appendix D only presents the rawinsonde data collected at CCAS at selected Zulu times before launch. It is noted that the #K21 launch occurred at 05:15 Zulu time (Zulu time for this launch corresponded to EST + 5 h). In Appendix D, altitude (**ALT**) is expressed in geometric feet, the wind direction (**DIR**) in degrees azimuth, the wind speed (**SPD**) in knots, and the ambient (**TEMP**) and dew point (**DPT**) temperatures in degrees Celsius. **I/R** is a measure of the refractive index of air, **V/S** is the speed of sound in air in knots at the indicated altitude, **VPS** is the saturation vapor pressure of water at the temperature measured at the given altitude, and **PW** is the precipitable water in the vertical column of air leading up to the altitude indicated.

More complete tabulations of the meteorological data determined during the #K21 mission are available from Gary Loper of The Aerospace Corporation, phone (310) 336-5922.

T-18 Hours and 30 Minutes

RS013091045
TEST NBR L6073 RS-5 L-1 HOUR 0510
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
1045Z 05 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	40	7.0	0.000	21.90	16.20	1021.70	70	13.510	1198.14	348	672	18.40	0
500	48	15.8	0.030	21.80	15.80	1004.55	69	13.190	1178.66	341	672	17.96	2
1000	49	14.9	0.003	20.20	15.10	987.07	72	12.670	1164.46	335	670	17.16	4
1500	51	14.1	0.003	18.70	14.70	969.82	78	12.410	1150.13	331	668	16.71	6
2000	54	12.8	0.005	17.40	14.60	952.79	84	12.430	1134.97	328	667	16.66	8
2500	57	11.6	0.005	16.00	14.50	935.96	91	12.370	1120.27	325	665	16.50	10
3000	60	10.1	0.006	14.50	13.90	919.37	96	11.980	1106.33	320	663	15.90	11
3500	65	7.5	0.009	13.00	12.60	902.98	98	11.080	1092.76	312	661	14.63	13
4000	34	1.4	0.021	13.40	8.60	886.83	73	8.470	1073.03	291	661	11.19	15
4500	300	7.4	0.026	14.40	-2.10	870.99	32	4.010	1052.81	259	662	5.31	16
5000	317	13.3	0.022	15.70	-3.70	855.47	26	3.510	1029.61	251	663	4.68	16
5500	312	15.0	0.007	14.90	-0.40	840.24	35	4.470	1013.37	253	662	5.94	17
6000	306	15.7	0.006	14.10	-0.70	825.25	36	4.380	998.10	249	662	5.80	17
6500	299	16.6	0.007	13.60	-2.50	810.48	33	3.850	982.47	242	661	5.09	18
7000	294	17.6	0.007	13.00	-3.90	795.95	31	3.470	967.04	237	660	4.58	18
7500	289	18.6	0.006	12.20	-4.40	781.66	31	3.340	952.18	233	659	4.40	19
8000	286	19.5	0.004	10.90	-4.80	767.56	33	3.250	939.35	229	658	4.26	19
8500	286	20.5	0.003	9.60	-4.70	753.65	36	3.310	926.67	227	656	4.32	20
9000	288	21.6	0.004	8.40	-4.90	739.94	38	3.260	913.54	224	655	4.24	20
9500	291	22.8	0.006	7.60	-6.30	726.44	36	2.940	899.51	219	654	3.81	21
10000	294	24.1	0.006	6.50	-4.00	713.13	47	3.540	886.10	220	653	4.57	21
10500	999	999.0	0.999	5.50	-3.60	700.02	52	3.650	872.98	218	652	4.70	22
11000	999	999.0	0.999	4.60	-5.70	687.12	48	3.160	859.93	212	650	4.06	22
11500	999	999.0	0.999	4.60	-13.70	674.42	27	1.800	844.84	200	650	2.30	23

TERMINATION 11666 GEOPFT 3556 GEOPM 669.7 MBS

MANDATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
629	48	16	21.4	15.5	1000	69
2079	54	13	17.1	14.6	950	85
3586	65	7	12.7	12.4	900	98
5170	315	14	15.4	-2.2	850	30
6848	295	17	13.2	-3.7	800	31
8616	286	21	9.2	-4.6	750	37
10481	999	999	5.5	-3.6	700	52

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	40	7	21.90	16.2	1021.7	348	70
251	48	16	22.50	16.3	1013.3	345	68
2065	54	13	17.20	14.6	950.6	328	85
2808	59	11	15.10	14.4	925.7	323	96
3319	64	9	13.40	13.1	908.9	315	98
3774	66	6	12.30	11.9	894.1	307	98
4000	33	1	13.40	8.6	886.8	291	73
4236	291	4	14.30	1.7	879.3	269	42
4471	298	7	14.30	-1.2	871.9	261	34
4707	312	10	15.10	-8.3	864.5	247	29
4937	317	13	15.80	-4.2	857.4	250	25
5398	313	15	15.10	-0.3	843.3	254	35
7435	289	19	12.40	-4.4	783.5	233	31
8818	287	21	8.70	-4.4	744.9	226	39
10244	296	25	6.00	-2.8	706.7	220	53
10960	999	999	4.60	-5.1	688.2	213	49
11690	999	999	4.60	-16.8	669.7	195	19

RM1045.XLS

RS013091145
TEST NBR L6073 RS-6 W.O.W. 4860
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
1145Z 05 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	40	10.0	0.000	21.80	16.30	1022.20	71.00	13.63	1199.07	349	672	18.55	0
1000	51	15.9	0.011	20.30	15.40	987.58	73.00	12.92	1164.57	337	670	17.50	4
2000	58	14.7	0.004	17.50	15.00	953.29	85.00	12.70	1134.93	330	667	17.04	8
3000	65	12.2	0.005	14.40	14.10	919.87	98.00	12.14	1107.06	321	663	16.11	12
4000	271	2.4	0.024	14.30	7.00	887.36	62.00	7.59	1070.88	285	662	10.06	15
5000	319	14.1	0.021	15.70	-6.90	856.00	21.00	2.77	1030.89	247	663	3.70	16
6000	314	17.1	0.005	13.90	-0.80	825.74	36.00	4.36	999.68	249	661	5.77	17
7000	300	19.4	0.008	12.20	-3.40	796.39	33.00	3.62	969.99	238	659	4.76	18
8000	290	20.6	0.007	10.80	-5.60	767.92	31.00	3.08	940.23	229	658	4.04	19
9000	289	20.3	0.001	8.50	-5.20	740.30	37.00	3.18	913.66	223	655	4.14	20
10000	291	20.5	0.002	6.40	-7.30	713.46	37.00	2.74	887.42	215	652	3.54	21
11000	301	23.1	0.007	4.60	-3.70	687.44	55.00	3.64	860.16	215	650	4.67	22
12000	293	24.7	0.006	5.00	-16.00	662.28	21.00	1.43	828.69	194	650	1.83	23
13000	302	24.4	0.007	3.50	-12.90	638.01	29.00	1.78	802.26	190	649	2.28	24
14000	298	24.8	0.003	0.60	-7.90	614.43	53.00	2.69	780.17	191	646	3.40	24
15000	288	26.6	0.008	-1.30	-7.70	591.55	62.00	2.73	756.41	186	643	3.42	25
16000	284	28.9	0.006	-3.50	-10.20	569.36	59.00	2.26	734.09	178	641	2.81	26
17000	283	32.1	0.005	-4.80	-13.80	547.84	49.00	1.70	710.15	169	639	2.11	26
18000	283	36.4	0.007	-6.50	-17.00	527.02	43.00	1.33	687.71	162	637	1.63	27
19000	285	39.2	0.005	-7.50	-23.30	506.90	27.00	0.76	664.42	153	635	0.93	27
20000	287	40.3	0.003	-9.40	-21.60	487.43	36.00	0.89	643.23	149	633	1.08	27
21000	288	42.7	0.004	-10.20	-31.30	468.63	16.00	0.37	620.55	141	632	0.44	28
22000	289	44.2	0.003	-12.30	-31.20	450.45	19.00	0.37	601.27	136	630	0.45	28
23000	289	45.4	0.002	-14.10	-32.10	432.85	20.00	0.34	582.01	132	627	0.41	28
24000	288	46.2	0.002	-16.60	-34.50	415.78	20.00	0.28	564.47	128	624	0.33	28
25000	286	47.8	0.003	-18.70	-36.50	399.25	19.00	0.23	546.56	123	622	0.27	28
26000	284	49.6	0.004	-21.10	-39.00	383.25	18.00	0.18	529.52	119	619	0.20	28
27000	280	50.1	0.005	-23.30	-40.60	367.74	19.00	0.15	512.73	115	616	0.17	28
28000	278	50.3	0.004	-25.60	-42.50	352.73	19.00	0.12	496.41	111	613	0.14	28
29000	277	51.5	0.002	-28.00	-44.50	338.20	19.00	0.10	480.47	108	610	0.11	28
30000	281	53.3	0.006	-30.60	-46.50	324.14	19.00	0.08	465.49	104	607	0.09	28
31000	285	55.8	0.008	-32.90	-48.40	310.52	19.00	0.07	450.22	101	604	0.07	28
32000	287	58.7	0.006	-34.80	-50.10	297.37	19.00	0.05	434.66	97	602	0.06	28
33000	287	60.3	0.003	-37.10	-50.80	284.65	23.00	0.05	420.14	94	599	0.06	28
34000	286	60.7	0.002	-39.60	-51.20	272.37	27.00	0.05	406.29	91	596	0.05	28
35000	286	60.3	0.001	-42.70	-53.00	260.48	31.00	0.04	393.72	88	592	0.04	28
36000	287	60.9	0.003	-45.70	-54.90	248.96	34.00	0.03	381.36	85	588	0.03	28
37000	289	62.2	0.004	-47.90	-56.60	237.82	35.00	0.03	367.85	82	585	0.03	28
38000	291	64.4	0.005	-50.00	-58.70	227.10	35.00	0.02	354.59	79	582	0.02	28
39000	293	65.4	0.004	-52.50	-60.90	216.74	35.00	0.02	342.12	76	579	0.02	28
40000	295	66.2	0.004	-54.80	-63.00	206.75	35.00	0.01	329.84	74	576	0.01	28
41000	298	68.1	0.007	-56.40	-64.50	197.15	34.00	0.01	316.81	71	574	0.01	28
42000	300	71.5	0.007	-59.00	99.90	187.90	999.00	99.99	305.62	68	570	0.01	999
43000	300	73.9	0.004	-61.20	99.90	178.99	999.00	99.99	294.22	66	567	0.00	999
44000	298	74.1	0.004	-64.00	99.90	170.41	999.00	99.99	283.82	63	564	0.00	999
45000	296	74.4	0.004	-66.50	99.90	162.13	999.00	99.99	273.34	61	560	0.00	999
46000	295	74.9	0.003	-67.90	99.90	154.19	999.00	99.99	261.76	58	558	0.00	999
47000	294	73.9	0.003	-70.80	99.90	146.55	999.00	99.99	252.28	56	555	0.00	999
48000	291	70.4	0.008	-72.70	99.90	139.22	999.00	99.99	241.97	54	552	0.00	999
49000	287	66.3	0.011	-74.40	99.90	132.19	999.00	99.99	231.67	52	550	0.00	999
50000	283	62.9	0.010	-75.90	99.90	125.46	999.00	99.99	221.53	49	548	0.00	999
51000	279	59.6	0.008	-77.50	99.90	119.03	999.00	99.99	211.91	47	545	0.00	999
52000	278	56.2	0.006	-76.00	99.90	112.93	999.00	99.99	199.56	44	547	0.00	999
53000	277	50.3	0.010	-75.20	99.90	107.17	999.00	99.99	188.65	42	548	0.00	999
54000	274	43.6	0.012	-73.70	99.90	101.73	999.00	99.99	177.71	40	550	0.00	999
55000	270	38.1	0.010	-71.10	99.90	96.63	999.00	99.99	166.62	37	554	0.00	999
56000	272	32.0	0.010	-71.10	99.90	91.81	999.00	99.99	158.32	35	554	0.00	999
57000	279	27.7	0.010	-72.00	99.90	87.22	999.00	99.99	151.04	34	553	0.00	999
58000	285	25.7	0.005	-72.60	99.90	82.84	999.00	99.99	143.91	32	552	0.00	999
59000	282	23.5	0.004	-72.90	99.90	78.68	999.00	99.99	136.88	30	552	0.00	999
60000	278	21.7	0.004	-72.80	99.90	74.73	999.00	99.99	129.97	29	552	0.00	999
61000	274	19.0	0.005	-74.20	99.90	70.96	999.00	99.99	124.25	28	550	0.00	999
62000	269	16.7	0.005	-70.00	99.90	67.39	999.00	99.99	115.60	26	556	0.00	999
63000	279	10.4	0.011	-68.00	99.90	64.07	999.00	99.99	108.82	24	558	0.00	999
64000	289	6.4	0.007	-65.50	99.90	60.94	999.00	99.99	102.26	23	562	0.00	999
65000	284	5.4	0.002	-66.50	99.90	57.98	999.00	99.99	97.75	22	560	0.00	999
66000	276	6.0	0.002	-64.80	99.90	55.16	999.00	99.99	92.25	21	563	0.00	999

67000	276	4.6	0.002	-63.50	99.90	52.50	999.00	99.99	87.25	19	564	0.00	999
68000	312	2.7	0.005	-61.90	99.90	49.99	999.00	99.99	82.44	18	567	0.00	999
69000	1	4.7	0.006	-59.30	99.90	47.62	999.00	99.99	77.59	17	570	0.00	999
70000	12	6.1	0.003	-59.00	99.90	45.38	999.00	99.99	73.83	16	570	0.00	999
71000	51	3.8	0.007	-60.00	99.90	43.24	999.00	99.99	70.68	16	569	0.00	999
72000	103	4.0	0.006	-58.90	99.90	41.20	999.00	99.99	66.97	15	571	0.00	999
73000	110	4.7	0.001	-55.40	99.90	39.27	999.00	99.99	62.84	14	575	0.00	999
74000	74	4.0	0.005	-55.50	99.90	37.45	999.00	99.99	59.94	13	575	0.00	999
75000	56	5.3	0.003	-56.00	99.90	35.72	999.00	99.99	57.30	13	574	0.00	999
76000	75	7.2	0.005	-56.80	99.90	34.06	999.00	99.99	54.85	12	573	0.00	999
77000	107	10.1	0.009	-54.00	99.90	32.48	999.00	99.99	51.65	12	577	0.00	999
78000	122	11.5	0.005	-52.50	99.90	30.99	999.00	99.99	48.95	11	579	0.00	999
79000	136	10.7	0.005	-51.90	99.90	29.58	999.00	99.99	46.58	10	580	0.00	999
80000	134	9.6	0.002	-51.00	99.90	28.24	999.00	99.99	44.27	10	581	0.00	999
81000	130	10.8	0.002	-49.70	99.90	26.96	999.00	99.99	42.03	9	583	0.00	999
82000	132	10.6	0.001	-50.70	99.90	25.74	999.00	99.99	40.30	9	581	0.00	999
83000	133	7.6	0.005	-50.20	99.90	24.57	999.00	99.99	38.40	9	582	0.00	999
84000	92	6.1	0.008	-49.20	99.90	23.47	999.00	99.99	36.50	8	583	0.00	999
85000	82	9.8	0.007	-49.30	99.90	22.41	999.00	99.99	34.88	8	583	0.00	999
86000	93	12.0	0.005	-49.30	99.90	21.40	999.00	99.99	33.32	7	583	0.00	999
87000	97	12.7	0.002	-48.60	99.90	20.44	999.00	99.99	31.72	7	584	0.00	999
88000	90	12.3	0.003	-48.20	99.90	19.53	999.00	99.99	30.23	7	585	0.00	999
89000	79	12.8	0.004	-46.30	99.90	18.65	999.00	99.99	28.64	6	587	0.00	999
90000	74	15.2	0.004	-45.50	99.90	17.83	999.00	99.99	27.29	6	588	0.00	999
91000	73	17.2	0.003	-45.30	99.90	17.04	999.00	99.99	26.05	6	588	0.00	999
92000	69	18.9	0.004	-43.90	99.90	16.29	999.00	99.99	24.75	6	590	0.00	999
93000	64	19.4	0.003	-43.40	99.90	15.57	999.00	99.99	23.61	5	591	0.00	999
94000	60	18.3	0.003	-43.40	99.90	14.89	999.00	99.99	22.58	5	591	0.00	999
95000	56	16.7	0.003	-45.10	99.90	14.24	999.00	99.99	21.75	5	589	0.00	999
96000	51	15.5	0.003	-46.70	99.90	13.61	999.00	99.99	20.93	5	587	0.00	999
97000	42	17.0	0.005	-47.60	99.90	13.00	999.00	99.99	20.08	4	585	0.00	999
98000	33	18.7	0.005	-48.20	99.90	12.42	999.00	99.99	19.23	4	585	0.00	999
99000	23	19.4	0.006	-46.30	99.90	11.86	999.00	99.99	18.22	4	587	0.00	999
100000	15	21.6	0.006	-45.00	99.90	11.34	999.00	99.99	17.32	4	589	0.00	999
101000	9	23.2	0.005	-43.20	99.90	10.84	999.00	99.99	16.43	4	591	0.00	999
102000	7	24.8	0.003	-42.40	99.90	10.37	999.00	99.99	15.65	3	592	0.00	999
103000	3	24.0	0.003	-43.60	99.90	9.91	999.00	99.99	15.05	3	591	0.00	999
104000	354	22.9	0.006	-44.20	99.90	9.48	999.00	99.99	14.42	3	590	0.00	999
105000	339	22.6	0.01	-44.50	99.90	9.06	999.00	99.99	13.81	3	589	0.00	999
106000	327	23.9	0.009	-44.30	99.90	8.66	999.00	99.99	13.19	3	590	0.00	999
107000	322	25.4	0.004	-44.10	99.90	8.28	999.00	99.99	12.60	3	590	0.00	999
108000	325	27.0	0.004	-44.60	99.90	7.92	999.00	99.99	12.07	3	589	0.00	999
109000	999	999.0	0.999	-45.10	99.90	7.57	999.00	99.99	11.56	3	589	0.00	999
110000	999	999.0	0.999	-46.10	99.90	7.24	999.00	99.99	11.10	2	587	0.00	999

TERMINATION 109438 GEOPFT 33357 GEOPM 7.2 MBS
TROPOPAUSE 51020 FEET 118.91 MB -77.5 C 99.9C

T-17 Hours and 30 Minutes

MANDATORY LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR
643	49	16	21.3	15.80	1000.00	71
2094	58	14	17.2	15.00	950.00	87
3601	79	6	13.9	10.90	900.00	82
5187	319	15	15.4	-4.60	850.00	25
6863	302	19	12.4	-3.20	800.00	33
8630	288	20	9.5	-5.30	750.00	35
10493	298	22	5.7	-1.20	700.00	61
12477	301	24	4.8	-12.50	650.00	27
14596	291	26	-0.6	-6.90	600.00	62
16860	283	32	-4.7	-13.30	550.00	51
19305	286	40	-8.4	-23.40	500.00	29
21970	289	44	-12.3	-31.20	450.00	19
24889	286	48	-18.6	-36.30	400.00	19
28107	277	50	-26.1	-42.90	350.00	19
31703	287	58	-34.5	-49.70	300.00	19
35796	287	61	-45.5	-54.70	250.00	34
40561	297	67	-55.9	-64.10	200.00	34
43308	299	74	-62.4	99.90	175.00	999
46373	294	75	-69.7	99.90	150.00	999
49878	282	63	-75.9	99.90	125.00	999
54115	273	42	-72.7	99.90	100.00	999
58429	284	24	-73.0	99.90	80.00	999
60995	271	18	-74.5	99.90	70.00	999
64023	291	6	-65.6	99.90	60.00	999
67677	311	3	-61.9	99.90	50.00	999
72259	115	5	-57.3	99.90	40.00	999
78290	133	11	-52.1	99.90	30.00	999
82186	135	9	-50.5	99.90	25.00	999
86986	94	13	-48.4	99.90	20.00	999
93283	60	18	-43.3	99.90	15.00	999
102158	4	24	-43.4	99.90	10.00	999

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	40	10	21.8	16.30	1022.20	349	71
195	43	17	22.8	16.80	1015.80	348	69
2261	60	14	16.7	15.00	944.50	329	90
2887	63	13	14.8	14.50	923.60	323	98
3373	70	10	13.1	13.00	907.60	314	99
3590	79	7	13.9	11.10	900.50	303	83
3808	130	1	14.2	8.80	893.50	293	70
4238	286	6	14.3	4.00	879.80	274	50
4451	296	8	14.3	0.90	873.10	265	40
4664	309	11	14.6	-2.70	866.40	256	30
4876	319	14	15.8	-8.30	859.80	245	18
5903	315	17	14.0	-0.40	828.60	251	37
7632	292	20	11.5	-5.40	778.30	231	30
10301	295	21	6.1	-8.30	705.50	212	35
10493	298	22	5.7	-1.10	700.50	222	62
11116	302	23	4.3	-4.30	684.50	213	54
11302	302	24	4.0	-1.10	679.70	218	69
11487	301	24	4.9	-12.30	675.10	200	28
11884	293	24	4.7	-11.70	665.20	198	29
12093	293	25	5.2	-19.50	660.00	190	15
12498	301	24	4.8	-12.50	650.10	193	27
14094	297	25	0.4	-7.30	612.30	191	56
15845	284	28	-3.1	-10.10	572.80	179	59
16418	283	30	-4.4	-10.70	560.30	176	61
18770	285	39	-7.0	-23.20	511.50	154	26
20018	287	40	-9.4	-21.60	487.10	149	36
20214	287	40	-9.2	-23.00	483.40	147	31
20415	286	41	-9.3	-27.90	479.50	144	20
20612	287	42	-9.5	-30.60	475.90	143	16
22408	289	45	-12.8	-30.60	443.20	135	21
32043	287	59	-34.9	-50.20	296.80	97	19
33412	286	61	-38.1	-50.20	279.60	93	26

45958	295	75	-67.8	99.90	154.50	58	999
46747	294	74	-70.3	99.90	148.50	57	999
51020	279	59	-77.5	99.90	118.90	47	999
54887	270	39	-71.1	99.90	97.20	37	999
57587	284	27	-72.6	99.90	84.60	33	999
60143	277	21	-73.0	99.90	74.20	29	999
60916	274	19	-74.1	99.90	71.30	28	999
61368	269	18	-74.6	99.90	69.60	27	999
62075	269	17	-69.5	99.90	67.10	26	999
63850	288	7	-65.5	99.90	61.40	23	999
65166	282	5	-66.8	99.90	57.50	22	999
68522	350	3	-59.9	99.90	48.70	18	999
71163	60	4	-60.1	99.90	42.90	16	999
73047	109	5	-55.2	99.90	39.20	14	999
75906	71	7	-57.1	99.90	34.20	12	999
77222	110	11	-53.4	99.90	32.10	11	999
80925	130	11	-49.6	99.90	27.10	9	999
85929	92	12	-49.4	99.90	21.50	7	999
89639	74	15	-45.7	99.90	18.10	6	999
92124	68	19	-43.7	99.90	16.20	5	999
96720	44	17	-47.4	99.90	13.20	5	999
98392	30	19	-48.2	99.90	12.20	4	999
101237	8	24	-42.6	99.90	10.70	4	999
110173	999	999	-46.3	99.90	7.20	2	999

T-12 Hours and 15 Minutes

RS013091701
TEST NBR A0000 MVP 0510
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
1700Z 05 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	70	10.0	0.000	25.8	15.2	1023.20	52	12.52	1184.75	338	676	17.28	0
100	42	9.2	0.080	24.1	13.5	1020.22	51	11.31	1188.66	332	674	15.53	0
200	31	10.6	0.039	22.9	12.6	1016.68	52	10.66	1189.74	328	673	14.57	1
300	42	12.4	0.049	22.6	12.9	1013.13	54	10.90	1186.82	329	672	14.87	1
400	49	13.7	0.033	22.1	12.9	1009.60	56	10.94	1184.60	329	672	14.90	1
500	52	14.6	0.021	21.7	13.0	1006.07	58	11.00	1181.98	329	671	14.97	2
600	53	14.5	0.006	21.2	12.8	1002.54	59	10.91	1179.86	328	671	14.82	2
700	55	13.9	0.012	20.8	12.7	999.03	60	10.81	1177.56	327	670	14.66	2
800	57	13.4	0.012	20.4	12.6	995.52	61	10.79	1174.69	326	670	14.62	3
900	59	13.4	0.008	20.1	12.6	992.02	62	10.80	1171.90	326	669	14.62	3
1000	61	13.5	0.009	19.8	12.6	988.53	63	10.83	1168.84	325	669	14.64	3
1100	64	13.7	0.011	19.6	12.6	985.05	64	10.82	1165.82	325	669	14.62	4
1200	67	14.0	0.015	19.2	12.6	981.58	65	10.81	1162.93	324	668	14.58	4
1300	71	14.3	0.017	19.0	12.7	978.11	67	10.93	1159.75	324	668	14.73	4
1400	73	14.3	0.009	18.7	12.7	974.66	68	10.90	1156.81	323	668	14.67	5
1500	75	14.2	0.009	18.5	12.8	971.21	70	10.99	1153.51	323	668	14.79	5
1600	76	13.8	0.008	18.2	12.7	967.78	71	10.93	1150.74	322	667	14.70	5
1700	74	13.1	0.013	17.8	12.5	964.35	71	10.77	1148.23	321	667	14.46	6
1800	71	12.6	0.015	17.5	12.4	960.93	72	10.71	1145.31	320	666	14.37	6
1900	69	12.3	0.008	17.3	12.4	957.52	73	10.77	1142.05	320	666	14.44	6
2000	68	12.1	0.005	17.0	12.5	954.12	75	10.81	1139.03	319	666	14.48	7
2100	68	12.0	0.002	16.7	12.5	950.72	76	10.84	1136.10	319	666	14.51	7
2200	68	12.2	0.003	16.4	12.5	947.34	78	10.87	1133.13	319	665	14.52	7
2300	68	12.0	0.003	16.1	12.6	943.97	80	10.93	1130.18	318	665	14.59	8
2400	68	11.7	0.006	15.8	12.6	940.60	81	10.96	1127.30	318	665	14.62	8
2500	68	11.3	0.007	15.5	12.6	937.24	83	10.96	1124.39	317	664	14.60	8
2600	67	10.9	0.006	15.3	12.6	933.89	84	10.95	1121.28	317	664	14.58	9
2700	66	9.8	0.020	15.0	12.6	930.55	86	11.01	1118.34	316	664	14.63	9
2800	66	8.5	0.022	14.7	12.7	927.22	87	11.03	1115.43	316	663	14.65	9
2900	65	7.4	0.018	14.4	12.6	923.90	89	11.02	1112.55	315	663	14.62	10
3000	66	7.1	0.005	14.1	12.6	920.59	90	10.98	1109.68	314	663	14.56	10
3100	72	8.1	0.022	13.3	12.4	917.28	94	10.86	1108.80	314	662	14.36	10
3200	73	9.1	0.017	13.0	12.1	913.98	94	10.73	1106.15	312	661	14.16	11
3300	74	9.0	0.003	12.7	12.0	910.68	96	10.64	1103.44	311	661	14.04	11
3400	76	8.3	0.014	12.4	11.9	907.40	97	10.56	1100.74	310	661	13.92	11
3500	80	7.3	0.019	12.0	11.7	904.12	98	10.43	1098.09	309	660	13.73	12
3600	84	6.4	0.018	11.8	11.3	900.85	97	10.21	1095.31	307	660	13.43	12
3700	90	5.4	0.018	11.6	11.1	897.59	97	10.04	1092.06	305	660	13.20	12
3800	96	4.5	0.019	11.5	10.8	894.34	95	9.87	1088.56	304	659	12.96	13
3900	104	3.5	0.019	11.5	10.5	891.10	93	9.64	1084.73	301	659	12.67	13
4000	113	2.1	0.024	11.4	10.0	887.87	92	9.38	1081.45	299	659	12.32	13
4100	143	0.7	0.026	11.2	9.7	884.65	90	9.17	1078.18	297	659	12.04	13
4200	262	1.2	0.028	11.1	9.4	881.44	89	8.99	1074.90	295	659	11.79	14
4300	275	2.8	0.028	10.9	9.0	878.24	88	8.74	1071.71	293	659	11.46	14
4400	279	4.4	0.028	10.8	8.5	875.05	85	8.47	1068.29	290	658	11.10	14
4500	283	6.1	0.029	10.7	7.8	871.87	82	8.11	1065.02	288	658	10.62	14
4600	286	7.8	0.029	10.6	6.9	868.70	78	7.62	1061.80	284	658	9.98	15
4700	287	9.0	0.020	10.9	5.4	865.54	69	6.85	1057.34	278	658	8.98	15
4800	289	9.9	0.017	11.4	2.9	862.39	56	5.78	1052.23	270	659	7.58	15
4900	291	10.8	0.016	12.2	-0.4	859.26	43	4.56	1046.47	261	659	6.01	15
5000	295	11.6	0.018	13.2	-4.6	856.15	29	3.33	1039.48	252	660	4.40	15
5100	296	12.1	0.010	13.7	-5.4	853.06	26	3.08	1034.27	249	661	4.08	15
5200	296	12.6	0.008	13.9	-5.0	849.99	26	3.17	1029.66	249	661	4.20	16
5300	297	13.6	0.018	13.9	-3.0	846.92	31	3.72	1025.61	251	661	4.92	16
5400	298	14.9	0.022	13.8	-1.3	843.87	35	4.22	1021.79	253	661	5.59	16
5500	300	16.0	0.020	13.8	-0.4	840.83	38	4.47	1018.21	254	661	5.92	16
5600	300	16.9	0.015	13.7	-0.9	837.80	36	4.32	1014.87	253	661	5.72	16
5700	302	17.5	0.012	13.8	-1.0	834.78	36	4.28	1011.01	251	661	5.67	16
5800	302	18.2	0.013	13.8	-1.3	831.77	35	4.20	1007.39	250	661	5.56	16

5900	303	19.0	0.012	13.7	-1.8	828.77	34	4.05	1004.23	249	661	5.36	16
6000	301	19.2	0.012	13.5	-2.1	825.78	34	3.96	1001.29	247	661	5.24	17
6100	299	19.4	0.012	13.3	-1.9	822.80	35	4.01	998.18	247	661	5.31	17
6200	297	19.7	0.014	13.2	-1.7	819.83	36	4.07	995.09	247	660	5.38	17
6300	294	20.1	0.015	13.0	-1.7	816.87	36	4.10	992.02	246	660	5.41	17
6400	292	20.5	0.013	12.8	-1.6	813.92	37	4.11	988.98	246	660	5.43	17
6500	291	21.0	0.011	12.7	-1.6	810.97	37	4.11	985.96	245	660	5.42	17
6600	291	21.5	0.009	12.5	-1.9	808.04	37	4.03	983.00	244	660	5.31	17
6700	292	21.8	0.008	12.4	-2.1	805.11	36	3.98	979.92	243	659	5.24	17
6800	293	22.1	0.008	12.3	-2.4	802.20	36	3.89	976.79	242	659	5.12	18
6900	294	22.3	0.007	12.2	-2.9	799.29	35	3.74	973.64	240	659	4.93	18
7000	294	22.3	0.001	12.0	-3.2	796.39	35	3.67	970.83	239	659	4.83	18
7100	294	22.4	0.006	11.7	-3.6	793.50	34	3.57	968.13	238	659	4.70	18
7200	292	22.5	0.010	11.5	-4.0	790.62	34	3.47	965.42	236	658	4.56	18
7300	291	22.8	0.010	11.3	-4.3	787.75	33	3.39	962.58	235	658	4.46	18
7400	289	23.1	0.013	11.1	-4.0	784.88	35	3.47	959.96	235	658	4.55	18
7500	287	23.5	0.012	10.9	-3.9	782.02	35	3.48	957.09	235	658	4.57	18
7600	287	23.9	0.009	10.7	-4.2	779.18	35	3.43	954.12	234	657	4.49	18
7700	286	24.2	0.007	10.6	-4.5	776.34	34	3.34	951.14	233	657	4.38	19
7800	286	24.5	0.006	10.4	-4.7	773.51	34	3.29	948.22	232	657	4.31	19
7900	286	24.7	0.005	10.2	-4.9	770.68	34	3.25	945.51	231	657	4.25	19
8000	287	24.7	0.008	10.0	-4.9	767.87	35	3.25	942.84	230	657	4.24	19
8100	288	24.5	0.010	9.7	-4.8	765.06	35	3.28	940.17	230	656	4.28	19
8200	290	23.9	0.012	9.4	-4.5	762.27	37	3.35	937.67	230	656	4.37	19
8300	290	23.2	0.012	9.2	-4.6	759.47	37	3.34	935.04	229	656	4.35	19
8400	289	22.5	0.013	8.9	-4.0	756.69	40	3.51	932.45	230	655	4.56	19
8500	288	21.8	0.014	8.6	-3.1	753.92	43	3.73	929.84	230	655	4.85	19
8600	287	21.4	0.011	8.4	-3.0	751.15	44	3.76	927.12	230	655	4.88	19
8700	285	21.2	0.009	8.3	-3.0	748.39	45	3.76	924.20	229	655	4.88	20
8800	284	21.0	0.010	8.0	-2.9	745.64	46	3.80	921.67	229	654	4.93	20
8900	282	20.8	0.009	7.7	-2.6	742.90	48	3.88	919.21	229	654	5.03	20
9000	281	20.7	0.006	7.5	-2.4	740.16	49	3.95	916.48	229	654	5.12	20
9100	281	20.6	0.003	7.3	-2.7	737.43	49	3.87	913.60	228	654	5.01	20
9200	281	20.7	0.004	7.2	-3.2	734.72	47	3.72	910.60	226	654	4.82	20
9300	282	20.9	0.007	7.2	-4.3	732.01	44	3.44	907.54	224	653	4.46	20
9400	284	21.2	0.009	7.2	-5.6	729.31	40	3.11	904.39	221	653	4.02	20
9500	285	21.2	0.006	7.2	-3.0	726.62	49	3.81	900.62	225	654	4.93	20
9600	286	21.2	0.006	7.1	-1.5	723.94	54	4.23	897.44	226	653	5.47	21
9700	286	21.2	0.005	6.9	-1.4	721.27	55	4.26	894.62	226	653	5.51	21
9800	287	21.2	0.003	6.8	-1.9	718.61	54	4.11	891.89	224	653	5.31	21
9900	287	21.4	0.003	6.6	-2.0	715.95	54	4.08	889.06	224	653	5.27	21
10000	288	21.7	0.007	6.3	-1.9	713.31	56	4.13	886.64	224	653	5.33	21
10100	289	21.9	0.007	6.1	-1.7	710.67	57	4.19	884.09	223	652	5.41	21
10200	290	22.1	0.008	5.9	-1.4	708.04	59	4.27	881.45	223	652	5.50	21
10300	291	22.7	0.012	5.6	-1.1	705.41	62	4.37	879.11	223	652	5.63	21
10400	292	23.3	0.012	5.3	-1.0	702.80	64	4.43	876.61	223	651	5.69	22
10500	293	23.6	0.009	5.1	-0.7	700.19	66	4.52	873.99	223	651	5.81	22
10600	294	23.8	0.007	4.9	-0.3	697.59	69	4.65	871.34	224	651	5.96	22
10700	294	23.8	0.004	4.6	-0.1	695.00	71	4.72	868.87	223	651	6.05	22
10800	295	23.1	0.013	4.3	0.1	692.41	74	4.81	866.36	223	650	6.15	22
10900	999	999.0	0.999	4.2	0.1	689.83	74	4.79	863.63	223	650	6.13	22
11000	999	999.0	0.999	4.1	-0.5	687.27	72	4.62	860.87	221	650	5.91	22

TERMINATION 11070 GEOPFT 3374 GEOPM 684.9 MBS

MANDATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
671	54	14.0	20.9	12.7	1000.0	60
2118	68	12.0	16.6	12.5	950.0	77
3620	86	6.0	11.7	11.3	900.0	97
5191	296	13.0	13.9	-5.0	850.0	26
6863	294	22.0	12.2	-2.8	800.0	35
8626	286	21.0	8.3	-3.0	750.0	44
10487	293	24.0	5.1	-0.7	700.0	66

T-12 Hours and 15 Minutes

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	70	10	25.8	15.2	1023.2	338	52
153	25	10	23.1	12.4	1018.4	328	51
3011	66	7	14.1	12.6	920.2	314	90
3479	79	8	12.1	11.7	904.8	309	98
4317	276	3	10.9	8.9	877.7	293	87
4589	286	8	10.6	7.1	869.0	284	79
5025	296	12	13.5	-5.7	855.4	250	26
5462	299	16	13.8	-0.3	842.0	255	38
5877	303	19	13.7	-1.7	829.5	249	34
7826	285	25	10.4	-4.8	772.8	231	34
7949	287	25	10.1	-4.9	769.3	230	34
8977	282	21	7.5	-2.4	740.8	229	50
9392	284	21	7.2	-5.9	729.5	221	39
9644	286	21	7.0	-1.0	722.8	227	56
10960	999	999	4.1	0.0	688.3	222	75
11092	999	999	4.0	-1.5	684.9	218	67

T-8 Hours and 1 Minute

RS013092114
TEST NBR A1546 W 2 2490
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
2114Z 05 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	20	5.0	0.000	24.2	16.1	1022.10	61	13.34	1189.38	344	674	18.31	0
1000	36	10.9	0.010	21.7	15.8	987.63	69	13.22	1158.95	337	672	17.98	4
2000	40	9.2	0.003	18.7	16.0	953.51	84	13.47	1130.07	333	668	18.15	8
3000	48	7.6	0.003	15.2	14.9	920.21	98	12.71	1104.08	324	664	16.91	12
4000	37	6.0	0.003	13.0	11.6	887.71	91	10.33	1074.57	303	661	13.65	15
5000	360	5.2	0.006	11.4	9.0	856.15	85	8.79	1042.69	287	659	11.54	18
6000	296	17.7	0.027	13.2	-0.5	825.66	39	4.44	1001.82	250	661	5.87	20
7000	294	20.4	0.005	11.7	-1.4	796.26	40	4.20	971.24	242	659	5.53	22
8000	292	22.9	0.005	9.6	-2.6	767.73	42	3.88	943.52	234	656	5.07	23
9000	289	24.7	0.004	7.6	-5.2	740.02	40	3.21	916.20	224	654	4.15	24
10000	289	24.3	0.001	5.9	-0.1	713.13	65	4.73	887.28	227	652	6.09	25
11000	290	24.0	0.001	4.3	0.0	687.11	73	4.78	859.73	222	650	6.13	27
12000	289	24.5	0.001	3.0	-2.2	661.91	69	4.08	832.58	211	649	5.20	28
13000	285	26.2	0.004	1.2	-4.6	637.47	65	3.43	807.52	202	646	4.34	29
14000	285	28.3	0.003	-0.6	-5.8	613.79	68	3.17	782.66	195	644	3.98	30
15000	286	34.5	0.011	-0.6	-14.0	590.90	35	1.65	754.30	179	644	2.08	31
16000	283	34.8	0.003	-2.6	-15.7	568.77	36	1.44	731.62	172	641	1.80	31
17000	283	36.6	0.003	-4.6	-18.6	547.31	32	1.14	709.30	165	639	1.41	32
18000	284	39.8	0.006	-6.5	-20.6	526.52	32	0.97	687.33	159	637	1.19	32
19000	284	43.3	0.006	-8.2	-24.3	506.39	26	0.70	665.32	153	635	0.86	32
20000	284	46.9	0.006	-9.5	-27.2	486.90	22	0.54	643.12	147	633	0.66	32
21000	284	51.1	0.007	-10.5	-27.9	468.10	22	0.51	620.62	142	632	0.61	32
22000	282	54.5	0.006	-12.8	-24.6	449.92	36	0.69	601.52	139	629	0.83	33
23000	280	55.8	0.005	-14.7	-20.6	432.30	61	1.00	582.03	136	627	1.20	33
24000	278	55.6	0.003	-16.7	-24.4	415.26	51	0.72	563.75	130	624	0.85	33
25000	277	54.9	0.002	-19.1	-29.3	398.73	40	0.46	546.58	125	621	0.54	33
26000	278	54.8	0.001	-21.8	-31.7	382.72	40	0.37	530.23	121	618	0.43	33
27000	280	56.4	0.005	-24	-32.1	367.19	48	0.36	513.30	117	615	0.41	34
28000	283	58.4	0.007	-26.2	-34.4	352.17	46	0.29	496.68	113	613	0.33	34
29000	287	60.6	0.007	-28.3	-35.7	337.63	49	0.26	480.30	109	610	0.29	34
30000	290	62.8	0.007	-30.4	-39.1	323.59	42	0.18	464.29	105	607	0.20	34
31000	289	65.2	0.004	-33.2	-40.4	310.00	48	0.16	449.93	101	604	0.18	34
32000	287	68.6	0.008	-35.6	-40.7	296.84	59	0.16	435.16	98	601	0.17	34
33000	284	72.1	0.008	-37.4	-43.5	284.13	52	0.12	419.72	94	599	0.13	34
34000	283	75.1	0.006	-39.6	-47.1	271.87	44	0.08	405.41	91	596	0.09	34
35000	281	75.4	0.003	-41.6	-49.6	260.02	41	0.06	391.15	88	593	0.06	34
36000	281	74.4	0.003	-44.0	-52.5	248.60	37	0.04	377.89	85	590	0.05	34
37000	281	73.0	0.002	-46.5	-54.9	237.56	37	0.03	365.06	82	587	0.03	34
38000	283	73.2	0.003	-49.1	-57.6	226.89	36	0.02	352.84	79	583	0.02	34
39000	285	75.8	0.008	-51.9	-60.2	216.58	36	0.02	341.02	76	580	0.02	34
40000	289	78.8	0.009	-54.3	-62.4	206.63	36	0.01	328.91	73	577	0.01	34
41000	292	81.6	0.008	-56.8	-64.7	197.02	36	0.01	317.29	71	573	0.01	34
42000	294	83.4	0.006	-59.7	99.9	187.77	999	99.99	306.42	68	570	0.01	999
43000	294	85.1	0.003	-62.2	99.9	178.82	999	99.99	295.32	66	566	0.00	999
44000	293	85.7	0.002	-64.3	99.9	170.22	999	99.99	283.96	63	563	0.00	999
45000	292	84.2	0.003	-67.1	99.9	161.93	999	99.99	273.85	61	559	0.00	999
46000	291	82.0	0.005	-69.8	99.9	153.95	999	99.99	263.72	59	556	0.00	999
47000	289	81.0	0.006	-71.6	99.9	146.28	999	99.99	252.85	56	553	0.00	999
48000	284	81.5	0.012	-74.4	99.9	138.92	999	99.99	243.55	54	549	0.00	999
49000	279	79.9	0.012	-76.2	99.9	131.84	999	99.99	233.18	52	547	0.00	999
50000	275	76.1	0.010	-76.6	99.9	125.09	999	99.99	221.67	49	547	0.00	999
51000	275	73.5	0.005	-76.1	99.9	118.68	999	99.99	209.83	47	547	0.00	999
52000	999	999.0	0.999	-73.5	99.9	112.66	999	99.99	196.58	44	551	0.00	999

TERMINATION 52063 GEOPFT 15869 GEOPM 111.1 MBS

T-8 Hours and 1 Minute

MANDATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
643	34	11.0	22.7	15.7	1000.0	65
2101	41	9.0	18.3	15.9	950.0	86
3613	46	7.0	13.6	12.8	900.0	95
5190	350	5.0	11.2	8.4	850.0	83
6859	295	20.0	12.0	-1.3	800.0	39
8620	290	24.0	8.3	-4.8	750.0	39
10480	290	24.0	5.2	0.5	700.0	72
12458	287	25.0	2.1	-3.7	650.0	65
14567	288	33.0	-0.3	-12.8	600.0	38
16835	282	36.0	-4.4	-18.1	550.0	33
19278	284	44.0	-8.7	-24.9	500.0	25
21941	282	54.0	-12.7	-24.6	450.0	36
24857	277	55.0	-18.9	-28.8	400.0	41
28069	284	59.0	-26.6	-34.4	350.0	48
31663	287	68.0	-35.1	-40.5	300.0	57
35762	281	75.0	-43.7	-52.2	250.0	38
40549	291	81.0	-56.0	-63.9	200.0	36
43287	294	86.0	-63.1	99.9	175.0	999
46341	290	81.0	-70.7	99.9	150.0	999
49822	275	76.0	-76.6	99.9	125.0	999

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	20	5.0	24.2	16.1	1022.1	344	61
197	30	13.0	23.9	15.7	1015.7	341	60
2668	46	8.0	16.4	15.7	931.2	329	96
3107	48	7.0	14.8	14.6	916.7	322	99
4185	32	6.0	12.7	11.0	881.8	299	89
4804	11	5.0	11.7	9.7	862.3	290	87
5484	338	6.0	10.8	7.5	841.2	278	80
5655	312	9.0	13.3	2.2	836.0	259	47
5826	298	16.0	13.3	0.8	830.9	254	42
6575	295	19.0	12.7	-1.3	808.6	245	38
8400	290	24.0	8.8	-4.6	756.5	229	38
9622	288	24.0	6.4	-1.5	723.2	227	57
10204	289	24.0	5.7	0.7	707.8	228	70
13137	285	27.0	0.9	-4.8	634.2	201	65
13672	284	28.0	-0.1	-4.8	621.5	198	71
14252	285	29.0	-1.0	-6.5	608.0	192	66
14444	288	31.0	-0.6	-10.8	603.5	185	46
14637	289	34.0	-0.2	-13.3	599.1	181	36
14828	286	34.0	-0.2	-13.4	594.8	180	36
17851	284	39.0	-6.3	-20.1	529.6	160	32
20255	284	48.0	-9.7	-28.6	482.0	145	20
20893	284	51.0	-10.3	-28.3	470.1	142	21
22664	281	56.0	-14.2	-18.7	438.2	139	69
23315	279	56.0	-15.1	-22.4	426.9	134	53
23902	278	56.0	-16.5	-24.0	416.9	131	52
25192	277	55.0	-19.6	-30.5	395.6	124	37
26469	278	55.0	-22.8	-35.1	375.4	118	31
27113	280	57.0	-24.3	-31.5	365.5	117	51
29883	290	63.0	-30.1	-38.8	325.2	105	42
31894	287	68.0	-35.4	-40.5	298.2	98	59
33972	283	75	-39.5	-47.0	272.2	91	44
34688	282	76	-40.9	-48.7	263.7	89	42
35425	281	75	-42.5	-50.9	255.1	86	39
41354	293	82	-57.8	-65.6	193.7	70	36
43963	293	86	-64.2	99.9	170.5	63	999
45367	292	84	-68.1	99.9	159.0	60	999
47789	284	82	-74.0	99.9	140.5	55	999
49102	278	80	-76.3	99.9	131.1	52	999
49677	275	77	-76.6	99.9	127.2	50	999
52268	999	999	-72.7	99.9	111.1	43	999

RS013092244
TEST NBR A1546 WS3 1620
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
2244Z 05 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	50	2.0	0.000	22.50	17.70	1022.30	74	14.85	1195.58	355	673	20.26	0
1000	51	9.3	0.012	21.60	16.10	987.83	71	13.46	1159.27	339	672	18.32	4
2000	66	9.1	0.004	18.30	15.40	953.66	83	13.04	1131.84	331	668	17.54	8
3000	77	8.5	0.003	15.40	14.70	920.33	96	12.59	1103.60	323	664	16.76	12
4000	70	5.5	0.005	13.20	10.50	887.86	84	9.65	1074.17	299	661	12.75	15
5000	316	5.9	0.016	13.90	-2.30	856.33	32	3.88	1036.99	255	661	5.14	18
6000	296	18.5	0.022	13.70	-3.20	826.00	31	3.66	1000.87	245	661	4.85	19
7000	293	22.4	0.007	11.70	-5.70	796.60	29	3.05	972.49	235	658	4.01	20
8000	291	24.6	0.004	9.90	-6.20	768.04	32	2.95	943.37	228	656	3.86	21
9000	288	24.3	0.003	8.30	-4.10	740.35	43	3.58	914.37	226	655	4.65	22
10000	293	25.6	0.004	6.90	1.00	713.56	66	5.10	884.48	229	653	6.59	23
11000	298	27.8	0.006	5.90	-2.30	687.64	56	4.03	855.97	216	652	5.19	25
12000	302	30.4	0.005	3.40	-3.90	662.49	59	3.60	832.34	208	649	4.59	26
13000	302	31.8	0.003	0.90	-4.70	638.05	66	3.41	809.05	202	646	4.32	27
14000	297	35.4	0.008	0.20	-13.40	614.36	35	1.74	781.89	185	645	2.19	28
15000	292	38.1	0.007	-0.40	-20.50	591.47	20	0.95	754.99	174	644	1.20	28
16000	288	37.7	0.005	-2.50	-16.30	569.33	34	1.37	732.03	172	642	1.71	28
17000	287	37.7	0.000	-4.40	-22.10	547.86	24	0.85	709.73	164	639	1.05	29
18000	290	40.0	0.005	-6.40	-25.60	527.05	20	0.62	688.07	157	637	0.76	29
19000	290	43.7	0.006	-8.70	-28.60	506.88	18	0.47	667.39	152	634	0.58	29
20000	288	46.1	0.005	-10.00	-31.20	487.34	16	0.37	645.04	146	632	0.45	29
21000	284	47.6	0.006	-10.70	-32.10	468.48	15	0.34	621.64	141	632	0.41	29
22000	280	49.1	0.006	-12.30	-33.00	450.28	16	0.31	601.13	136	630	0.38	29
23000	278	50.6	0.004	-14.40	-35.00	432.67	15	0.26	582.42	131	627	0.31	29
24000	277	52.2	0.003	-16.90	-35.50	415.60	18	0.25	564.97	128	624	0.29	30
25000	279	54.2	0.004	-19.10	-31.50	399.05	32	0.37	546.98	124	621	0.43	30
26000	283	56.0	0.008	-21.80	-28.80	383.02	53	0.49	530.54	122	618	0.56	30
27000	289	57.6	0.010	-23.70	-29.60	367.50	59	0.46	513.05	118	616	0.53	30
28000	292	59.7	0.007	-25.50	-35.90	352.50	37	0.25	495.69	112	614	0.28	30
29000	292	62.6	0.005	-28.20	-36.50	337.98	45	0.23	480.57	109	610	0.27	30
30000	290	65.9	0.007	-30.40	-38.00	323.92	47	0.20	464.74	105	607	0.23	30
31000	287	68.7	0.007	-33.00	-39.40	310.32	52	0.18	449.99	102	604	0.20	30
32000	999	999.0	0.999	-34.60	-42.00	297.17	47	0.14	433.89	98	602	0.15	30

TERMINATION 32849 GEOPFT 9982 GEOPM 286.4 MBS

MANDATATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
649	48	9	22.8	16.6	1000	68
2106	68	9	18.0	15.5	950	85
3617	76	7	14.0	12.0	900	87
5197	298	13	14.5	-1.7	850	33
6871	294	22	12.0	-5.7	800	29
8632	290	25	8.8	-6.2	750	34
10499	295	26	6.6	0.0	700	62
12482	302	31	2.1	-4.3	650	63
14592	293	38	0.0	-19.6	600	21
16861	287	38	-4.2	-21.4	550	25
19302	290	45	-19.3	-29.6	500	17
21961	280	49	-21.4	-33.0	450	16
24876	279	54	-18.9	-31.6	400	32
28092	293	60	-25.9	-36.4	350	36
31688	999	999	-34.4	-40.8	300	52

T-6 Hours and 31 Minutes

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	50	2	22.5	17.7	1022.30	355	74
204	39	10	23.9	18.0	1015.60	353	70
580	47	9	23.0	16.7	1002.40	344	68
2650	75	9	16.4	15.3	931.90	327	93
3162	78	8	14.9	14.5	915.00	321	97
3698	75	7	13.9	11.6	897.60	304	86
4245	65	5	12.7	9.7	880.00	294	82
4796	24	3	12.2	5.6	862.70	276	64
4976	322	5	13.8	-2.4	857.10	255	32
5156	299	13	14.4	-1.8	851.50	254	33
5337	297	16	14.6	-1.4	846.00	253	33
6429	295	20	13.1	-5.6	813.30	239	27
8152	291	25	9.7	-6.3	763.80	227	32
8920	289	25	8.3	-7.1	742.50	222	33
9110	286	24	8.2	-0.1	737.40	232	56
9884	292	25	7.0	1.3	716.60	230	67
10529	295	26	6.6	-0.1	699.80	223	62
11153	299	28	5.7	-3.0	683.80	214	53
12365	302	31	2.4	-4.2	653.50	206	62
12989	302	32	0.9	-4.6	638.30	202	66
13620	301	32	0.4	-6.4	623.30	196	60
13824	299	33	0.3	-10.0	618.50	190	46
14031	297	36	0.2	-14.0	613.60	185	33
14843	293	38	-0.1	-21.3	595.00	175	18
16045	288	38	-2.6	-16.1	568.40	172	34
17199	288	38	-4.8	-23.3	543.70	162	22
19056	290	44	-8.8	-28.8	505.80	151	18
20338	287	47	-10.3	-31.9	480.90	144	15
20958	284	47	-10.6	-32.0	469.30	141	15
22241	280	49	-12.5	-33.4	446.00	135	15
22871	278	50	-14.1	-34.8	434.90	132	15
24208	277	52	-17.5	-35.5	412.10	127	19
25555	281	55	-20.6	-30.5	390.10	123	41
26198	284	56	-22.3	-28.1	379.90	121	59
27559	291	59	-24.4	-34.7	359.10	114	37
31463	286	70	-34.2	-39.1	304.20	100	61
32155	999	999	-34.7	-42.9	295.20	97	43
32847	999	999	-35.8	-45.5	286.40	94	36

T-5 Hours and 1 Minute

RS013100014
TEST NBR A1546 WS4 1620
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
0014Z 06 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	20	4.0	0.000	20.4	17.8	1022.50	85	15.04	1204.32	359	670	20.38	0
1000	56	10.0	0.012	21.5	17.0	988.01	76	14.25	1159.61	344	672	19.38	5
2000	67	9.4	0.003	18.3	15.6	953.83	85	13.21	1132.24	332	668	17.76	9
3000	84	8.4	0.005	15.5	14.8	920.50	96	12.66	1103.27	323	665	16.86	13
4000	96	6.4	0.004	12.9	11.6	888.02	92	10.37	1075.04	303	661	13.70	16
5000	305	7.4	0.023	12.6	4.2	856.45	57	6.29	1040.34	270	660	8.29	19
6000	292	16.8	0.016	12.8	-1.2	826.01	38	4.24	1003.61	250	660	5.60	20
7000	293	21.3	0.008	11.2	-3.7	796.54	35	3.57	973.77	239	658	4.68	21
8000	292	25.5	0.007	9.4	0.1	767.96	52	4.76	943.86	240	656	6.20	22
9000	283	23.8	0.007	8.0	2.4	740.28	67	5.59	913.79	239	655	7.26	24
10000	288	24.9	0.004	6.4	1.9	713.47	73	5.45	885.94	232	653	7.03	26
11000	296	28.0	0.008	5.6	-2.6	687.51	55	3.91	856.94	216	652	5.04	27
12000	302	32.1	0.009	2.9	-3.0	662.34	65	3.84	833.67	210	648	4.88	28
13000	305	35.0	0.006	0.3	-3.5	637.84	76	3.76	810.43	205	645	4.75	29
14000	303	35.5	0.003	-1.9	-4.7	614.05	81	3.44	786.69	198	643	4.31	30
15000	288	34.0	0.015	-0.7	-14.7	591.05	35	1.59	754.80	178	644	2.00	31
16000	288	34.4	0.001	-2.4	-17.6	568.92	30	1.24	731.24	171	642	1.54	32
17000	291	36.6	0.005	-4.5	-19.3	547.47	31	1.09	709.19	165	639	1.35	32
18000	292	40.7	0.007	-5.9	-25.5	526.69	19	0.62	686.27	157	637	0.77	32
19000	292	45.1	0.007	-7.7	-23.5	506.58	28	0.78	664.26	153	635	0.95	33
20000	292	48.3	0.005	-9.0	-23.8	487.14	29	0.73	642.01	148	634	0.89	33
21000	290	49.2	0.003	-12.0	-24.0	468.30	36	0.73	624.17	144	630	0.88	33
22000	286	49.5	0.006	-14.1	-25.3	450.00	38	0.65	604.74	139	628	0.78	33
23000	283	50.0	0.005	-15.1	-30.6	432.32	25	0.40	583.49	133	626	0.48	33
24000	282	51.6	0.003	-17.4	-29.1	415.23	36	0.47	565.28	129	624	0.55	34
25000	284	53.8	0.004	-19.7	-28.1	398.67	47	0.51	547.72	126	621	0.60	34
26000	286	55.4	0.005	-22.2	-29.1	382.62	53	0.47	530.85	122	618	0.55	34
27000	289	55.6	0.005	-23.5	-36.6	367.11	29	0.24	512.10	116	616	0.27	34
28000	291	55.5	0.004	-25.7	-41.4	352.13	21	0.14	495.65	111	613	0.16	34
29000	291	56.1	0.001	-28.3	-41.9	337.60	26	0.13	480.37	108	610	0.15	34
30000	291	59.5	0.006	-31.4	-42.4	323.54	32	0.13	466.08	105	606	0.14	34
31000	292	66.2	0.011	-33.7	-42.8	309.89	39	0.12	450.87	101	603	0.14	34
32000	999	999.0	0.999	-34.7	-44.6	296.74	35	0.10	433.54	97	602	0.11	34

TERMINATION 32478 GEOPFT 9899 GEOPM 289.4 MBS

MANDATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
654	53	10.0	22.5	17.6	1000.0	74
2110	69	9.0	17.9	15.6	950.0	86
3622	93	7.0	13.8	13.3	900.0	97
5200	298	12.0	13.1	1.5	850.0	45
6869	293	21.0	11.4	-3.1	800.0	36
8629	284	24.0	8.5	2.3	750.0	65
10494	292	26.0	6.2	-0.8	700.0	62
12475	305	34.0	1.5	-2.0	650.0	78
14575	297	35.0	-2.3	-5.8	600.0	77
16843	291	36.0	-4.2	-18.3	550.0	32
19289	292	46.0	-8.0	-26.5	500.0	21
21945	286	49.0	-14.1	-25.3	450.0	38
24853	283	54.0	-19.5	-28.2	400.0	46
28066	291	56.0	-26.1	-41.5	350.0	22
31655	999	999.0	-34.5	-44.1	300.0	37

T-5 Hours and 1 Minute

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	20	4	20.4	17.8	1022.5	359	85
192	47	10	23.8	19.8	1016.2	363	78
544	52	10	22.8	17.8	1003.9	350	73
2227	70	9	17.5	15.5	946.2	330	88
3345	90	8	14.5	14.2	909.2	318	98
3813	96	7	13.3	12.6	894.0	309	96
4743	80	3	12.0	8.3	864.5	285	78
4922	314	5	12.3	5.7	858.9	275	64
5104	300	11	13.0	2.2	853.2	264	48
5468	295	15	13.2	-0.3	842.1	255	39
6064	292	17	12.8	-1.3	824.1	249	38
7196	293	22	10.8	-4.7	790.9	236	33
7901	298	26	9.7	-5.1	770.7	231	35
8015	291	25	9.4	0.9	767.5	241	55
8954	283	24	8.1	2.4	741.5	239	67
10137	289	25	6.1	2	709.9	231	75
10737	294	27	6.2	-2.4	694.3	217	54
12575	305	34	1.3	-1.8	648.2	210	80
13191	305	35	-0.2	-4.2	633.3	202	74
13829	304	36	-1.6	-4.7	618.1	199	80
14425	301	35	-2.8	-4.8	604.2	195	86
14822	293	34	-1.6	-7.1	595.1	188	66
15020	288	34	-0.6	-15.5	590.6	177	31
17502	292	38	-5.4	-23.3	537.0	160	23
18071	292	41	-6.0	-25.8	525.3	156	19
18674	292	44	-7.3	-20.2	513.1	156	35
19314	292	46	-8.0	-26.7	500.4	150	21
19852	292	48	-8.6	-23.8	490.0	148	28
20493	291	49	-10.3	-23.8	477.8	146	32
21720	287	49	-13.9	-24.7	455.1	141	39
23053	283	50	-15.2	-30.9	431.4	132	25
25541	285	55	-21.0	-27.3	389.9	124	57
27381	290	55	-24.2	-40.7	361.3	114	20
30015	291	60	-31.4	-42.4	323.3	105	33
30607	292	63	-33.1	-42.2	315.2	103	39
31222	292	68	-34.1	-43.2	306.9	100	39
31987	999	999	-34.7	-44.6	296.9	97	35
32575	999	999	-35.9	-46.4	289.4	95	33

T-3 Hours and 51 Minutes

RS013100124
TEST NBR A1546 WS5 1560
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
0124Z 06 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	60	3.0	0.000	18.2	16.3	1022.30	89	13.76	1214.02	354	668	18.50	0
1000	73	10.4	0.013	21.2	16.7	987.74	75	13.97	1160.50	342	671	18.98	4
2000	87	9.3	0.004	18.1	15.7	953.55	86	13.3	1132.59	333	668	17.88	9
3000	102	8.2	0.004	15.3	15.0	920.22	98	12.8	1103.51	324	664	17.04	13
4000	108	5.0	0.005	13.1	11.3	887.72	89	10.14	1074.32	302	661	13.40	16
5000	299	13.8	0.032	13.4	-0.6	856.23	38	4.45	1038.44	259	661	5.88	18
6000	296	20.5	0.011	13.1	-3.7	825.81	31	3.55	1002.92	245	660	4.69	19
7000	295	24.2	0.006	11.5	-2.3	796.38	38	3.95	972.37	241	658	5.18	20
8000	296	26.1	0.003	9.9	2.9	767.84	62	5.76	941.49	246	657	7.52	21
9000	294	26.6	0.002	8.0	2.9	740.20	70	5.8	913.52	240	655	7.52	23
10000	295	27.8	0.002	6.2	1.3	713.39	70	5.19	886.37	230	653	6.69	25
11000	297	29.6	0.004	4.4	-1.6	687.37	65	4.27	860.06	219	650	5.47	26
12000	300	31.4	0.004	2.2	-1.6	662.13	76	4.28	835.14	213	648	5.44	27
13000	303	33.5	0.005	-0.1	-3.1	637.60	80	3.86	811.15	206	645	4.86	29
14000	304	34.6	0.002	-1.9	-4.0	613.80	85	3.62	786.04	199	643	4.54	30
15000	303	34.7	0.001	-2.3	-6.1	590.83	75	3.09	758.17	189	642	3.86	31
16000	298	34.5	0.006	-3.8	-12.5	568.61	53	1.96	734.34	176	640	2.43	32
17000	292	39.4	0.010	-5.1	-20.6	547.10	28	0.95	710.40	165	638	1.18	32
18000	290	42.6	0.006	-6.2	-21.6	526.30	28	0.89	686.24	159	637	1.10	32
19000	290	46.0	0.006	-8.1	-21.9	506.20	32	0.86	664.76	154	635	1.05	32
20000	291	48.6	0.005	-10.6	-21.4	486.70	41	0.91	645.25	150	632	1.10	33
21000	290	49.9	0.002	-12.2	-25.5	467.80	32	0.64	624.24	143	630	0.77	33
22000	287	49.5	0.005	-14.4	-29.0	449.51	28	0.46	604.91	138	627	0.55	33
23000	285	49.6	0.004	-16.2	-27.6	431.80	36	0.53	585.08	134	625	0.63	33
24000	285	51.4	0.003	-18.4	-28.9	414.67	39	0.47	566.8	130	622	0.56	33
25000	288	53.6	0.006	-20.2	-31.6	398.08	36	0.38	548.01	125	620	0.44	34
26000	291	55.6	0.006	-21.8	-39.7	382.05	18	0.17	529.41	119	618	0.20	34
27000	293	57.2	0.004	-24.2	-42.5	366.55	17	0.12	512.95	115	615	0.14	34
28000	293	58.3	0.002	-26.5	-43.8	351.54	18	0.11	496.42	111	612	0.12	34
29000	291	60.9	0.005	-29.3	-44.7	336.99	21	0.1	481.33	108	609	0.11	34
30000	292	65.8	0.008	-31.8	-44.1	322.90	28	0.11	466	105	606	0.12	34
31000	294	71.1	0.01	-33.4	-44.9	309.29	30	0.1	449.43	101	604	0.11	34
32000	999	999.0	0.999	-35.7	-48.4	296.15	25	0.07	434.48	97	601	0.07	34

TERMINATION 32711 GEOPFT 9970 GEOPM 285.8 MBS

MANDATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
647	69	11.0	22.3	17.3	1000.0	73
2102	89	9.0	17.8	15.7	950.0	87
3613	107	7.0	13.5	12.8	900.0	96
5193	298	17.0	13.3	-2.2	850.0	34
6863	295	24.0	11.7	-2.8	800.0	36
8626	294	26.0	8.7	3.1	750.0	68
10490	296	29.0	5.3	0.2	700.0	69
12465	302	32.0	1.0	-1.7	650.0	82
14565	304	35.0	-1.6	-4.9	600.0	78
16825	292	39.0	-4.9	-20.7	550.0	28
19269	290	47.0	-8.8	-21.7	500.0	34
21918	287	50.0	-14.3	-28.9	450.0	28
24817	287	53.0	-20.0	-30.6	400.0	38
28026	292	58.0	-26.7	-43.9	350.0	18
31610	999	999.0	-35.0	-47.5	300.0	26

T-3 Hours and 51 Minutes

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	60	3	18.2	16.3	1022.3	354	89
213	61	12	23.4	19.5	1015.3	362	79
606	69	11	22.4	17.4	1001.5	348	73
2381	94	9	17.1	15.6	940.8	330	91
2980	102	8	15.4	15.0	920.9	324	98
3450	107	7	13.7	13.5	905.5	315	99
4065	108	5	13.0	11.0	885.7	300	88
4260	91	2	13.3	8.5	879.4	289	73
4835	300	11	13.4	0.7	861.4	263	42
5792	296	20	13.3	-2.3	832.0	249	34
6383	295	22	12.7	-6.2	814.4	239	26
6978	295	24	11.5	-2.1	797.0	241	39
7601	295	26	10.7	-7.5	779.1	229	27
7811	296	26	10.1	1.2	773.2	243	54
8022	296	26	9.9	3.1	767.2	246	62
8862	294	26	8.2	3.1	744.0	241	70
9480	294	27	7.5	2.0	727.2	235	68
11396	298	30	3.7	-3.5	677.3	213	59
11999	300	31	2.2	-1.6	662.1	213	76
12630	302	33	0.7	-1.7	646.6	210	84
13869	304	35	-2.0	-3.9	616.9	200	87
14463	304	35	-1.4	-4.6	603.1	194	79
15093	303	35	-2.5	-6.4	588.7	188	74
15733	302	34	-3.3	-8.3	574.5	182	68
15940	299	34	-3.8	-10.1	569.9	179	61
16149	295	36	-3.9	-18.2	565.4	170	32
18303	289	44	-6.4	-23.1	520.2	156	25
20251	291	49	-11.3	-21.4	481.9	149	43
21522	289	50	-13.2	-28.2	458.2	140	27
23447	284	50	-16.9	-28.1	424.1	132	37
24748	287	53	-19.8	-29.5	402.2	126	42
26130	291	56	-22.0	-40.7	380.0	118	16
30776	293	70	-33.0	-44.0	312.3	102	32
31400	295	73	-34.2	-46.6	304.0	99	27
32116	999	999	-36.0	-48.8	294.7	97	25
32809	999	999	-37.9	-51.4	285.8	95	23

T-2 Hours and 46 Minutes

RS013100229
TEST NBR A1546 WS6 1410
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
0229Z 06 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	60	3.0	0.000	19.6	17.7	1022.40	89	14.98	1207.55	359	669	20.24	0
1000	73	8.1	0.009	21.8	17.6	987.92	77	14.78	1157.76	346	672	20.12	5
2000	85	7.2	0.003	19.1	16.4	953.83	85	13.85	1128.66	335	669	18.68	9
3000	116	6.3	0.006	16.1	14.4	920.60	89	12.29	1101.13	320	665	16.41	13
4000	136	3.3	0.006	14.1	11.2	888.19	83	10.03	1071.28	300	662	13.30	16
5000	301	8.1	0.019	13.4	3.2	856.73	50	5.82	1037.96	267	661	7.70	19
6000	300	19.7	0.020	13.5	-2.0	826.35	34	4.00	1001.91	248	661	5.30	20
7000	300	23.2	0.006	12.2	0.1	796.97	43	4.68	970.03	245	659	6.16	21
8000	298	24.7	0.003	10.4	4.5	768.50	67	6.45	940.29	250	658	8.44	23
9000	295	26.2	0.003	8.6	3.9	740.90	72	6.23	912.26	242	656	8.10	25
10000	294	28.0	0.003	6.7	2.9	714.11	77	5.84	885.55	234	653	7.55	27
11000	296	29.9	0.003	4.8	1.3	688.13	78	5.22	859.33	224	651	6.70	28
12000	298	33.0	0.006	2.8	-0.4	662.90	79	4.66	834.06	216	649	5.94	30
13000	299	33.9	0.002	0.4	-1.5	638.33	88	4.34	810.48	208	646	5.48	31
14000	299	34.4	0.001	-2.4	-2.5	614.59	99	4.06	788.47	202	642	5.07	32
15000	305	38.4	0.009	-1.0	-5.9	591.75	71	3.23	755.63	189	644	4.05	34
16000	303	40.2	0.003	-1.8	-9.8	569.63	55	2.33	730.03	178	643	2.92	34
17000	298	41.7	0.007	-3.7	-12.5	548.23	51	1.88	707.81	170	640	2.34	35
18000	292	43.0	0.007	-5.6	-17.7	527.48	38	1.23	686.04	161	638	1.52	36
19000	292	45.0	0.004	-7.6	-18.6	507.36	42	1.18	664.82	156	636	1.44	36
20000	294	47.6	0.005	-9.2	-22.4	487.91	33	0.83	643.46	149	634	1.01	36
21000	293	48.6	0.002	-11.3	-23.9	469.05	35	0.73	623.61	144	631	0.88	36
22000	289	47.7	0.006	-13.7	-23.6	450.77	43	0.76	604.88	140	628	0.91	37
23000	283	47.0	0.008	-16.0	-26.7	433.04	39	0.58	586.32	135	625	0.69	37
24000	282	48.3	0.003	-18.2	-27.4	415.86	44	0.54	567.97	130	623	0.64	37
25000	285	51.3	0.007	-20.4	-29.3	399.23	45	0.46	549.95	126	620	0.54	37
26000	289	55.0	0.009	-21.6	-38.0	383.16	21	0.20	530.45	120	618	0.23	37
27000	999	999.0	0.999	-23.9	-41.7	367.64	17	0.13	513.74	115	615	0.15	37
28000	999	999.0	0.999	-26.4	-42.6	352.59	20	0.12	497.79	112	612	0.14	37

TERMINATION 28094 GEOPFT 8563 GEOPM 350.1 MBS

MANDATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
651	71	8.0	22.8	18.3	1000.0	76
2111	88	7.0	18.8	16.2	950.0	85
3626	129	5.0	14.5	12.6	900.0	88
5210	301	15.0	14.1	-0.1	850.0	38
6883	300	23.0	12.4	-0.6	800.0	41
8651	296	26.0	9.2	4.0	750.0	70
10519	295	29.0	6.0	1.7	700.0	74
12497	298	34.0	1.7	-1.0	650.0	82
14605	304	38.0	-0.9	-1.4	600.0	97
16878	298	42.0	-3.6	-12.2	550.0	51
19329	292	46.0	-7.7	-22.4	500.0	30
21988	289	48.0	-13.8	-23.8	450.0	43
24888	284	51.0	-20.3	-29.2	400.0	45

T-2 Hours and 46 Minutes

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	60	3	19.6	17.7	1022.4	359	89
231	72	9	23.7	20.2	1014.8	366	81
660	71	8	22.8	18.2	999.7	351	75
1913	83	7	19.3	16.6	956.8	336	84
2949	115	6	16.3	14.5	922.3	321	89
3478	127	5	14.7	13.2	905.0	312	91
4970	300	7	13.3	3.7	857.7	269	52
5164	301	14	14.1	0.0	851.7	258	38
6337	300	21	13.2	-3.4	816.3	243	31
6903	300	23	12.4	-0.5	799.8	244	41
8100	298	25	10.2	4.8	765.7	250	69
10491	295	29	6.1	1.8	701.3	228	74
11115	296	30	4.5	1.1	685.2	224	79
12338	298	34	2.2	-0.8	654.5	213	80
14056	299	34	-2.6	-2.6	613.3	202	100
14426	300	35	3.4	0.7	604.8	201	83
14613	304	37	-0.9	-1.2	600.5	199	98
15197	305	39	-1.1	-8.3	587.3	184	58
15760	304	40	-1.5	-8.9	574.9	180	57
18170	292	43	-5.9	-18.5	524.0	160	36
18801	291	45	-7.5	-16.6	511.3	158	48
19410	292	46	-7.7	-22.7	499.3	151	29
21239	293	49	-12.0	-23.3	464.6	143	38
23828	281	48	-17.9	-27.1	418.8	131	44
25093	285	52	-20.6	-29.4	397.7	125	45
25724	288	54	-21.0	-36.1	387.5	121	24
26365	290	56	-22.3	-40.5	377.4	118	17
26963	291	58	-23.8	-41.6	368.2	116	17
27595	999	999	-25.3	-42.1	358.6	113	19
28172	999	999	-26.9	-42.8	350.1	111	20

T-2 Hours and 31 Minutes

RS013100244
TEST NBR A1546 WS-6A 1050
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
0244Z 06 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	80	3.0	0.000	19.2	17.5	1022.40	90.00	14.85	1209.30	359	669	20.03	0
1000	94	9.0	0.010	21.5	17.0	987.90	76.00	14.30	1159.21	344	672	19.45	5
2000	103	8.4	0.002	18.6	16.4	953.76	87.00	13.83	1130.60	335	668	18.62	9
3000	118	6.9	0.004	15.9	15.3	920.47	96.00	13.05	1101.55	325	665	17.41	13
4000	231	0.5	0.012	14.4	9.1	888.08	71.00	8.85	1070.58	293	663	11.75	16
5000	303	10.5	0.018	14.2	-0.9	856.67	35.00	4.32	1036.14	257	662	5.73	18
6000	302	19.2	0.015	13.4	-3.0	826.30	32.00	3.70	1002.45	246	661	4.89	19
7000	300	23.6	0.008	11.9	-1.8	796.88	39.00	4.11	971.59	242	659	5.40	20
8000	298	25.0	0.003	10.1	4.3	768.38	68.00	6.39	941.21	249	657	8.35	22
9000	296	25.4	0.001	8.7	4.2	740.77	74.00	6.36	911.86	243	656	8.28	24
10000	296	26.8	0.002	7.0	3.0	714.00	76.00	5.85	884.48	234	654	7.57	26
11000	299	29.1	0.004	4.9	2.1	688.03	82.00	5.54	858.61	226	651	7.10	28
12000	302	32.0	0.005	3.0	-0.3	662.83	79.00	4.71	833.32	216	649	6.00	29
13000	304	34.5	0.005	0.7	-1.6	638.36	85.00	4.31	809.58	208	646	5.45	30
14000	305	35.8	0.002	-1.6	-2.0	614.59	97.00	4.20	785.81	202	643	5.26	32
15000	305	37.1	0.002	-1.6	-5.3	591.61	76.00	3.28	757.07	190	643	4.12	33
16000	302	39.2	0.004	-2.1	-8.9	569.46	60.00	2.51	730.32	179	642	3.14	34
17000	299	41.7	0.005	-3.7	-11.0	548.07	57.00	2.12	707.41	171	640	2.64	34
18000	297	42.7	0.004	-6.1	-12.8	527.29	59.00	1.86	686.85	165	637	2.29	35
19000	295	44.0	0.003	-8.4	-14.9	507.15	60.00	1.60	666.42	159	635	1.95	35
20000	295	45.8	0.003	-9.0	-21.8	487.67	35.00	0.88	642.66	149	634	1.07	36
21000	293	47.3	0.004	-11.4	-23.7	468.84	35.00	0.75	623.51	144	631	0.90	36
22000	999	999.0	0.999	-14.0	-23.6	450.54	44.00	0.76	605.29	140	628	0.91	36
23000	999	999.0	0.999	-16.3	-26.2	432.81	42.00	0.61	586.61	135	625	0.72	36

TERMINATION 23126 GEOPFT 7049 GEOPM 429.6 MBS

MANDATATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
651	92	9.0	22.7	17.7	1000.0	74.00
2108	105	8.0	18.2	16.3	950.0	88.00
3623	129	3.0	14.7	12.8	900.0	89.00
5208	303	13.0	14.1	-1.5	850.0	34.00
6880	300	23.0	12.0	-2.6	800.0	36.00
8646	297	25.0	9.1	4.5	750.0	73.00
10515	298	28.0	5.9	2.6	700.0	79.00
12495	303	33.0	1.8	-1.1	650.0	81.00
14599	305	37.0	-1.8	-3.9	600.0	86.00
16870	300	41.0	-3.5	-10.9	550.0	57.00
19317	295	45.0	-8.5	-18.0	500.0	47.00
21975	999	999.0	-14.1	-23.7	450.0	44.00

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	80	3.0	19.200	17.5	1022.4	359	90
224	84	9.0	24.0	19.9	1015.0	363	78
1318	96	9.0	20.5	16.5	977.0	339	78
2585	112	8.0	16.9	16.0	934.2	331	95
3234	122	6.0	15.3	14.9	912.8	322	98
4863	303	9.0	14.2	-0.5	860.9	259	36
5538	303	16.0	14.0	-2.4	840.2	250	32
6195	301	21.0	13.1	-3.3	820.5	244	32
8242	297	25.0	9.6	5.0	761.6	250	73

T-2 Hours and 31 Minutes

9480	296	26.0	7.8	3.9	727.8	239	77
12136	302	32.0	2.7	-0.6	659.5	214	79
13518	305	35.0	-0.6	-1.7	626.0	205	92
14219	305	36.0	-2.0	-2.2	609.5	201	99
14905	305	37.0	-1.6	-5.0	593.8	191	77
15652	304	38.0	-1.8	-7.4	577.1	183	65
16295	302	40.0	-2.3	-10.1	563.1	176	55
17450	298	42.0	-5.1	-12.0	538.7	169	58
18883	295	44.0	-8.4	-13.9	509.5	160	65
19620	295	45.0	-8.5	-20.2	495.0	152	38
20364	294	47.0	-9.5	-23.3	480.8	147	31
21800	289	47.0	-13.6	-23.0	454.2	141	45
22539	999	999.0	-15.2	-25.4	440.9	137	41
23185	999	999.0	-16.7	-26.5	429.6	134	42

T-2 Hours and 1 Minute

RS013100314
TEST NBR A1546 WS-6B 0870
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
0314Z 06 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	20	2.0	0.000	18.5	15.2	1022.20	81.00	12.82	1213.22	348	668	17.26	0
1000	93	6.4	0.010	21.3	17.4	987.66	78.00	14.61	1159.52	346	671	19.86	5
2000	110	6.5	0.003	17.9	16.4	953.50	91.00	13.85	1132.86	336	667	18.61	9
3000	135	3.8	0.006	15.3	14.0	920.13	92.00	12.06	1103.80	320	664	16.06	13
4000	278	2.4	0.010	13.7	9.8	887.69	78.00	9.26	1072.39	296	662	12.26	16
5000	302	10.7	0.015	13.0	0.9	856.22	43.00	4.93	1039.43	262	660	6.51	18
6000	301	18.4	0.013	12.4	-3.2	825.74	33.00	3.67	1005.08	247	659	4.84	19
7000	297	22.4	0.007	10.7	-2.1	796.24	42.00	4.05	974.81	242	658	5.30	20
8000	293	24.4	0.004	8.7	2.9	767.63	67.00	5.78	945.17	247	656	7.51	22
9000	293	26.0	0.003	7.8	3.9	739.93	76.00	6.25	913.62	243	655	8.11	24
10000	294	28.7	0.005	6.5	2.0	713.14	73.00	5.48	884.97	232	653	7.07	25
11000	296	31.5	0.005	4.4	0.3	687.16	75.00	4.89	859.42	222	651	6.26	27
12000	298	33.3	0.003	2.9	-0.6	661.95	78.00	4.61	832.66	215	649	5.87	28
13000	300	34.1	0.003	0.7	-2.5	637.50	79.00	4.01	808.56	206	646	5.07	30
14000	303	35.7	0.004	-1.0	-4.1	613.78	79.00	3.59	783.53	198	644	4.51	31
15000	304	38.1	0.004	-2.0	-5.2	590.84	79.00	3.32	757.23	190	643	4.15	32
16000	302	40.1	0.004	-3.3	-7.8	568.66	71.00	2.73	732.51	181	641	3.40	33
17000	300	41.7	0.004	-4.7	-10.2	547.20	65.00	2.27	708.73	173	639	2.81	33
18000	298	43.3	0.003	-7.2	-11.8	526.40	70.00	2.02	688.29	167	636	2.48	34
19000	298	45.2	0.003	-7.2	-21.3	506.28	32.00	0.93	662.73	154	636	1.14	35
20000	298	47.1	0.003	-9.3	-25.0	486.85	26.00	0.65	642.43	147	633	0.80	35
21000	999	999.0	0.999	-12.0	-24.5	468.00	35.00	0.7	623.95	144	630	0.84	35
22000	999	999.0	0.999	-14.8	-23.6	449.70	47.00	0.76	605.83	140	627	0.91	35

TERMINATIONA 22239 GEOPFT 6778 GEOPM 444.4 MBS

MANDATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
644	88	6	22.400	18.1	1000.0	77
2101	112	6	17.500	16.3	950.0	92
3611	192	1	14.2	12.0	900.0	87
5192	302	12	12.9	0.0	850.0	41
6859	298	22	11	-2.7	800.0	39
8617	293	25	8.2	4.1	750.0	76
10481	295	30	5.6	1.1	700.0	73
12460	299	34	1.9	-1.6	650.0	78
14565	304	37	-1.6	-4.8	600.0	78
16830	300	42	-4.4	-10.0	550.0	65
19274	298	46	-7.8	-23.0	500.0	28
21929	999	999	-14.7	-23.6	450.0	47

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	20	2.0	18.500	15.2	1022.2	348	81
240	79	5.0	23.700	20.0	1014.2	364	80
2084	111	7.0	17.600	16.3	950.7	336	92
2689	128	5.0	16.000	14.8	930.4	325	92
3448	161	2.0	14.400	13.0	905.5	312	91
4989	302	11.0	13.000	0.9	856.6	262	44
5721	302	17.0	12.800	-2.3	834.1	250	35
6483	300	21.0	11.800	-4.7	811.4	241	31
8022	293	24.0	8.700	3.0	767.0	247	67
9548	293	27.0	7.200	2.9	725.2	236	74
13535	302	35.0	-0.700	-3.4	624.7	202	82

T-2 Hours and 1 Minute

15127	304	38.0	-2.200	-5.3	588.0	189	79
15891	302	40.0	-3.200	-7.5	571.0	182	72
17466	299	42.0	-5.700	-11.2	537.4	170	65
18222	298	44.0	-7.800	-12.0	521.9	165	71
19054	298	45.0	-7.200	-21.9	505.2	153	30
19811	298	47.0	-8.800	-25.0	490.5	148	25
20715	297	48.0	-11.200	-25.1	473.3	145	30
21547	999	999.0	-13.600	-23.2	457.9	142	44
22295	999	999.0	-15.500	-23.9	444.4	139	48

T-1 Hours and 41 Minutes

RS013100334
TEST NBR A1546 W7R3 1290
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
0334Z 06 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	30	3.0	0.000	18.6	16.8	1022.20	89	14.24	1211.94	356	668	19.17	0
1000	81	9.0	0.013	20.9	17.2	987.68	79	14.49	1161.19	345	671	19.67	5
2000	91	8.0	0.003	18.2	17.1	953.49	93	14.52	1131.28	340	668	19.52	9
3000	121	5.3	0.007	15.3	15.0	920.18	98	12.79	1103.50	324	664	17.03	13
4000	156	2.3	0.006	13.7	10.8	887.73	83	9.82	1072.26	299	662	13.00	17
5000	308	13.3	0.026	13.4	-0.6	856.21	38	4.42	1038.27	258	661	5.84	19
6000	306	18.2	0.008	12.1	-2.4	825.74	36	3.91	1006.20	248	659	5.14	20
7000	291	22.3	0.011	9.9	1.7	796.18	57	5.34	976.62	251	657	6.97	21
8000	284	25.0	0.006	9.2	5.3	767.58	77	6.85	942.85	253	656	8.93	23
9000	290	27.1	0.006	8.2	3.8	739.94	74	6.20	912.38	242	655	8.05	25
10000	296	30.3	0.007	6.6	2.2	713.16	73	5.54	884.66	232	653	7.16	27
11000	298	32.6	0.004	4.4	-0.1	687.16	73	4.74	859.67	222	650	6.07	29
12000	298	32.4	0.000	2.2	-1.3	661.94	78	4.36	834.89	214	648	5.55	30
13000	302	32.3	0.003	0.5	-1.7	637.44	85	4.27	809.04	208	646	5.39	31
14000	305	34.5	0.005	-0.8	-3.6	613.73	81	3.72	782.72	198	644	4.68	32
15000	306	37.9	0.006	-2.2	-5.2	590.80	80	3.33	757.50	190	643	4.16	33
16000	306	39.5	0.003	-2.5	-8.4	568.64	64	2.60	730.44	180	642	3.25	34
17000	305	40.7	0.002	-4.8	-10.7	547.22	63	2.18	709.11	172	639	2.71	35
18000	304	42.9	0.004	-6.8	-12.9	526.41	62	1.84	687.50	165	637	2.26	36
19000	302	45.3	0.005	-8.1	-18.2	506.29	44	1.19	664.73	156	635	1.46	36
20000	299	46.4	0.004	-9.6	-24.1	486.83	30	0.72	643.06	148	633	0.87	36
21000	295	46.1	0.006	-12.3	-24.1	467.96	37	0.72	624.61	144	630	0.87	37
22000	288	46.1	0.010	-14.7	-23.3	449.66	48	0.78	605.68	140	627	0.93	37
23000	284	47.6	0.006	-16.5	-25.4	431.92	46	0.65	585.80	135	625	0.77	37
24000	284	50.9	0.006	-18.3	-27.4	414.78	45	0.55	566.78	130	622	0.64	37
25000	999	999.0	0.999	-19.7	-33.6	398.2	28	0.31	547.09	124	621	0.36	37

TERMINATION 25606 GEOPFT 7805 GEOPM 387.3 MBS

MANDATATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
645	79	9	22	17.8	1000	77
2100	93	8	17.9	17	950	94
3613	140	3	14.1	12.9	900	93
5193	314	16	13.4	-1.5	850	36
6857	292	22	10	1.1	800	54
8616	288	26	8.7	4.5	750	75
10482	298	32	5.4	1.0	700	73
12458	300	32	1.2	-1.2	650	84
14564	306	37	-1.5	-4.5	600	80
16830	305	40	-4.5	-10.4	550	63
19274	301	46	-8.3	-21.1	500	35
21927	288	46	-14.7	-23.2	450	48
24824	999	999	-19.6	-32.5	400	31

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	30	3	18.6	16.8	1022.2	356	89
145	73	9	23.8	20.5	1017.6	368	82
403	77	9	22.8	18.3	1008.5	354	76
1928	90	8	18.4	17.2	955.9	341	93
2478	102	7	16.9	16.6	937.5	335	98
2878	118	6	15.6	15.3	924.2	326	98

T-1 Hours and 41 Minutes

3437	135	4	14.3	13.8	905.9	316	97
4607	266	1	12.4	6.0	868.5	279	65
4800	306	6	12.6	2.6	862.4	268	50
4994	308	13	13.4	-0.6	856.4	259	38
6385	300	19	11.5	-3.3	814.3	244	35
7603	286	24	9.5	4.4	778.8	253	70
8809	289	27	8.6	4.0	745.2	244	73
11367	298	33	3.8	-0.9	677.8	218	71
12610	300	32	0.9	-1.2	646.9	211	86
15152	306	38	-2.4	-5.4	587.4	189	80
15807	306	39	-2.1	-8.0	572.9	181	64
17637	305	42	-6.1	-12.2	533.9	168	62
18331	303	44	-7.5	-13.7	519.7	163	61
19611	301	46	-8.4	-23.8	494.3	150	28
20820	296	46	-12.0	-24.8	471.3	145	34
21942	288	46	-14.6	-23.1	450.7	141	48
24368	285	52	-19.3	-27.7	408.6	129	47
25054	999	999	-19.7	-34.1	397.3	124	26
25674	999	999	-21.2	-39.1	387.3	120	18

T-1 Hour and 31 Minutes

RS013100344
TEST NBR A1546 WS-7A 0930
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
0344Z 06 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	110	3.0	0.000	18.1	16.3	1022.20	89	13.76	1214.33	354	668	18.49	0
1000	84	8.5	0.010	21.7	18.4	987.70	82	15.55	1157.74	351	672	21.16	5
2000	98	7.2	0.004	18.6	17.0	953.60	90	14.42	1129.77	339	668	19.41	9
3000	121	5.4	0.005	15.5	15.4	920.32	99	13.18	1102.55	326	665	17.56	14
4000	187	1.4	0.008	13.8	12.0	887.89	89	10.64	1071.34	304	662	14.09	17
5000	295	6.7	0.012	12.6	4.1	856.41	57	6.30	1040.27	271	660	8.31	20
6000	295	14.3	0.013	11.9	-1.4	825.90	40	4.20	1006.75	250	659	5.53	21
7000	290	19.6	0.009	10.9	-3.4	796.38	36	3.62	974.44	240	658	4.75	22
8000	288	23.2	0.006	9.6	4.7	767.81	71	6.53	942.04	251	657	8.52	24
9000	291	26.0	0.005	8.6	4.1	740.21	73	6.29	911.49	242	656	8.18	26
10000	295	28.6	0.005	7.1	1.5	713.46	68	5.27	883.82	230	654	6.81	28
11000	297	30.2	0.003	5.5	-1.1	687.52	63	4.40	857.04	219	652	5.65	29
12000	299	31.3	0.003	3.0	-0.8	662.35	76	4.53	832.76	214	649	5.77	30
13000	304	33.0	0.005	0.4	-1.5	637.90	87	4.34	809.90	208	646	5.47	32
14000	306	35.3	0.005	-0.6	-2.4	614.18	88	4.06	782.71	201	644	5.11	33
15000	306	37.9	0.004	-2.3	-4.4	591.22	86	3.53	758.42	192	642	4.41	34
16000	305	40.4	0.004	-3.0	-8.2	569.02	68	2.67	732.05	180	641	3.33	35
17000	305	42.8	0.004	-4.5	-11.1	547.58	60	2.11	708.75	172	640	2.62	36
18000	304	45.3	0.004	-6.0	-15.7	526.81	47	1.48	686.05	163	638	1.82	36
19000	303	46.8	0.003	-6.6	-21.6	506.75	29	0.88	661.67	153	637	1.08	37
20000	301	47.5	0.003	-9.2	-22.9	487.33	32	0.79	642.67	148	634	0.97	37
21000	298	47.0	0.005	-11.9	-23.6	468.48	37	0.75	624.29	144	630	0.91	37
22000	292	46.8	0.008	-14.2	-22.7	450.19	48	0.83	605.07	140	628	0.99	37
23000	999	999.0	0.999	-16.4	-24.6	432.46	49	0.70	586.39	135	625	0.83	37

TERMINATION 23365 GEOPFT 7122 GEOPM 425.1 MBS

MANDATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
645	80	9	22.7	19.4	1000.0	82
2104	100	7	18.3	16.9	950.0	92
3617	144	3	14.3	13.4	900.0	94
5199	296	8	12.5	2.3	850.0	51
6863	291	19	11.1	-3.2	800.0	37
8625	289	25	9.2	4.9	750.0	74
10495	296	30	6.4	-1.0	700.0	59
12476	301	32	1.7	-1.1	650.0	81
14583	307	37	-1.7	-3.5	600.0	87
16847	305	43	-4.2	-10.8	550.0	60
19299	303	47	-7.4	-22.1	500.0	30
21956	292	47	-14.2	-22.6	450.0	48

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	110	3	18.1	16.3	1022.2	354	89
261	74	9	23.8	21.6	1013.5	374	88
751	82	9	22.4	18.9	996.4	355	80
2853	117	6	15.9	15.9	925.2	329	100
3393	136	4	14.6	14.2	907.5	318	97
5540	298	11	12.3	-0.5	839.8	255	41
6269	295	16	11.7	-1.9	817.9	247	39
7025	290	20	10.9	-3.5	795.7	239	36
7744	287	22	9.6	4.2	775.0	251	69
8441	288	24	9.6	5.4	755.5	249	75

T-1 Hour and 31 Minutes

10641	296	30	6.3	-1.6	696.7	219	57
13019	304	33	0.3	-1.5	637.4	208	88
14686	307	37	-1.8	-3.7	598.4	195	87
15444	306	39	-3.1	-5.5	581.3	188	84
16222	305	41	-2.9	-9.2	564.2	178	62
17877	304	45	-6.0	-14.8	529.3	164	50
18749	304	47	-5.9	-21.2	511.7	154	28
19556	303	48	-8.0	-22.4	495.9	150	30
22818	999	999	-15.9	-24.2	435.6	136	49
23425	999	999	-17.6	-25.6	425.1	133	50

T-40 Minutes

RS013100435
TEST NBR A1546 W8 R4 4380
RAWINSONDE MSS/MSS
CAPE CANAVERAL AFS, FLORIDA
0435Z 06 NOV 95

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	20	3.0	0.000	17.3	15.0	1021.80	86	12.73	1217.84	348	666	17.07	0
1000	74	7.2	0.010	20.6	15.6	987.17	73	13.07	1162.98	337	670	17.71	4
2000	82	5.8	0.003	17.4	14.5	952.90	83	12.33	1135.17	328	667	16.52	8
3000	115	3.6	0.006	14.4	13.7	919.48	95	11.82	1106.66	319	663	15.69	12
4000	225	0.9	0.007	12.0	11.2	886.91	95	10.12	1077.35	302	660	13.31	15
5000	304	8.0	0.013	11.5	0.5	855.27	48	4.96	1043.73	263	659	6.51	17
6000	298	16.3	0.014	11.0	-7.1	824.70	27	2.73	1009.61	242	658	3.57	18
7000	289	20.4	0.009	9.6	-10.4	795.06	23	2.15	978.35	231	656	2.80	19
8000	284	23.2	0.006	7.5	1.7	766.35	67	5.35	948.05	245	654	6.93	20
9000	284	24.9	0.003	6.8	2.9	738.58	76	5.83	915.56	241	653	7.53	22
10000	286	25.1	0.002	5.0	0.6	711.69	73	4.98	888.22	229	651	6.40	24
11000	288	25.0	0.001	3.6	-3.4	685.64	60	3.72	860.81	215	649	4.75	25
12000	291	26.3	0.003	1.6	-2.0	660.39	77	4.16	834.78	213	647	5.28	26
13000	297	29.3	0.007	0.0	-3.1	635.90	80	3.86	808.80	205	645	4.86	27
14000	303	32.7	0.008	-0.9	-5.2	612.22	72	3.29	781.50	195	644	4.14	28
15000	307	37.7	0.009	-2.5	-7.3	589.30	70	2.84	756.96	187	642	3.54	29
16000	308	43.5	0.010	-3.5	-14.4	567.14	43	1.61	731.72	174	641	2.00	30
17000	305	47.6	0.008	-6.0	-13.1	545.67	57	1.80	710.39	170	638	2.22	30
18000	301	48.5	0.006	-7.9	-13.7	524.82	63	1.73	688.23	165	635	2.12	31
19000	296	48.0	0.007	-8.6	-16.7	504.70	52	1.36	663.86	157	634	1.66	31
20000	291	47.7	0.007	-9.9	-25.3	485.26	27	0.65	641.69	147	633	0.79	32
21000	288	48.5	0.004	-12.4	-26.5	466.44	29	0.58	622.75	143	630	0.70	32
22000	289	50.5	0.003	-14.8	-27.0	448.18	34	0.56	603.93	138	627	0.66	32
23000	291	52.2	0.004	-17.4	-26.8	430.48	44	0.57	586.03	134	624	0.68	32
24000	290	53.3	0.002	-19.8	-30.8	413.30	37	0.41	568.04	129	621	0.48	32
25000	290	55.1	0.003	-20.4	-40.2	396.72	15	0.16	546.72	123	620	0.18	32
26000	292	57.1	0.004	-23.2	-42.3	380.69	15	0.12	530.43	119	616	0.14	32
27000	291	59.0	0.003	-25.7	-43.7	365.15	17	0.11	513.99	115	613	0.12	33
28000	290	62.4	0.006	-28.2	-44.8	350.10	18	0.10	497.78	112	610	0.11	33
29000	290	66.5	0.007	-30.4	-41.2	335.54	34	0.15	481.49	108	607	0.16	33
30000	292	70.1	0.007	-33.4	-40.6	321.43	48	0.16	467.05	105	604	0.17	33
31000	295	72.2	0.006	-35.1	-47.2	307.78	29	0.08	450.47	101	601	0.09	33
32000	298	75.1	0.008	-37.0	-53.6	294.63	16	0.04	434.65	97	599	0.04	33
33000	302	79.1	0.011	-40.1	-56.7	281.90	15	0.03	421.35	94	595	0.03	33
34000	304	84.9	0.011	-42.5	-58.7	269.59	15	0.02	407.21	91	592	0.02	33
35000	304	89.5	0.008	-44.3	-60.1	257.70	15	0.02	392.29	88	590	0.02	33
36000	303	92.4	0.005	-47.2	-62.2	246.24	16	0.01	379.59	85	586	0.01	33
37000	304	93.1	0.001	-49.9	-64.2	235.14	16	0.01	366.88	82	582	0.01	33
38000	305	94.2	0.004	-53.1	-66.7	224.41	17	0.01	355.27	79	578	0.01	33
39000	307	95.9	0.006	-56.0	-69.0	214.03	18	0.01	343.37	77	574	0.01	33
40000	308	96.9	0.004	-58.6	-71.2	204.01	18	0.00	331.25	74	571	0.00	33
41000	307	95.9	0.003	-60.5	99.9	194.36	999	99.99	318.38	71	568	0.00	999
42000	305	94.1	0.007	-63.0	99.9	185.07	999	99.99	306.84	68	565	0.00	999
43000	303	93.5	0.006	-65.2	99.9	176.13	999	99.99	295.11	66	562	0.00	999
44000	302	94.2	0.003	-68.3	99.9	167.51	999	99.99	284.83	63	558	0.00	999
45000	300	92.5	0.006	-70.1	99.9	159.23	999	99.99	273.15	61	555	0.00	999
46000	296	89.5	0.011	-71.0	99.9	151.30	999	99.99	260.72	58	554	0.00	999
47000	291	86.8	0.014	-72.2	99.9	143.73	999	99.99	249.21	56	553	0.00	999
48000	285	87.7	0.015	-74.6	99.9	136.47	999	99.99	239.47	53	549	0.00	999
49000	284	88.8	0.003	-75.4	99.9	129.53	999	99.99	228.19	51	548	0.00	999
50000	289	85.4	0.014	-74.2	99.9	122.94	999	99.99	215.30	48	550	0.00	999
51000	296	77.6	0.022	-72.5	99.9	116.75	999	99.99	202.70	45	552	0.00	999
52000	302	66.4	0.022	-72.6	99.9	110.88	999	99.99	192.58	43	552	0.00	999
53000	301	56.9	0.016	-73.8	99.9	105.29	999	99.99	184.05	41	550	0.00	999
54000	293	48.7	0.018	-74.7	99.9	99.96	999	99.99	175.51	39	549	0.00	999
55000	282	45.6	0.016	-75.6	99.9	94.88	999	99.99	167.30	37	548	0.00	999
56000	275	46.0	0.010	-74.7	99.9	90.05	999	99.99	158.07	35	549	0.00	999
57000	275	44.8	0.002	-73.7	99.9	85.49	999	99.99	149.31	33	551	0.00	999
58000	284	40.7	0.013	-68.4	99.9	81.22	999	99.99	138.21	31	558	0.00	999

59000	299	34.2	0.020	-68.1	99.9	77.23	999	99.99	131.24	29	558	0.00	999
60000	310	26.9	0.016	-69.5	99.9	73.42	999	99.99	125.62	28	556	0.00	999
61000	309	19.1	0.013	-70.9	99.9	69.78	999	99.99	120.19	27	554	0.00	999
62000	294	13.7	0.011	-71.3	99.9	66.30	999	99.99	114.41	25	554	0.00	999
63000	283	13.4	0.004	-69.9	99.9	63.00	999	99.99	107.98	24	556	0.00	999
64000	287	13.7	0.002	-68.7	99.9	59.89	999	99.99	102.03	23	557	0.00	999
65000	283	9.5	0.007	-66.4	99.9	56.96	999	99.99	95.96	21	561	0.00	999
66000	261	5.5	0.008	-65.5	99.9	54.19	999	99.99	90.90	20	562	0.00	999
67000	235	5.9	0.004	-63.7	99.9	51.57	999	99.99	85.77	19	564	0.00	999
68000	235	6.4	0.001	-62.2	99.9	49.10	999	99.99	81.09	18	566	0.00	999
69000	227	7.5	0.003	-61.1	99.9	46.76	999	99.99	76.82	17	568	0.00	999
70000	237	7.0	0.002	-60.8	99.9	44.54	999	99.99	73.07	16	568	0.00	999
71000	245	4.7	0.004	-61.1	99.9	42.43	999	99.99	69.69	16	568	0.00	999
72000	249	2.0	0.005	-60.8	99.9	40.41	999	99.99	66.29	15	568	0.00	999
73000	301	0.5	0.003	-58.8	99.9	38.51	999	99.99	62.59	14	571	0.00	999
74000	304	1.5	0.002	-57.5	99.9	36.70	999	99.99	59.30	13	572	0.00	999
75000	313	1.9	0.001	-57.1	99.9	34.99	999	99.99	56.42	13	573	0.00	999
76000	353	0.8	0.002	-57.2	99.9	33.36	999	99.99	53.80	12	573	0.00	999
77000	114	2.9	0.006	-57.0	99.9	31.80	999	99.99	51.25	11	573	0.00	999
78000	131	6.6	0.007	-55.8	99.9	30.32	999	99.99	48.61	11	575	0.00	999
79000	140	5.4	0.003	-54.6	99.9	28.92	999	99.99	46.11	10	576	0.00	999
80000	105	0.3	0.009	-52.7	99.9	27.59	999	99.99	43.61	10	579	0.00	999
81000	358	3.0	0.005	-52.1	99.9	26.33	999	99.99	41.50	9	580	0.00	999
82000	42	4.4	0.005	-52.2	99.9	25.13	999	99.99	39.64	9	579	0.00	999
83000	59	5.9	0.004	-51.6	99.9	23.99	999	99.99	37.72	8	580	0.00	999
84000	63	9.7	0.007	-50.4	99.9	22.90	999	99.99	35.82	8	582	0.00	999
85000	66	15.1	0.009	-49.3	99.9	21.87	999	99.99	34.03	8	583	0.00	999
86000	71	19.8	0.008	-48.0	99.9	20.89	999	99.99	32.32	7	585	0.00	999
87000	73	24.3	0.008	-46.5	99.9	19.96	999	99.99	30.67	7	587	0.00	999
88000	73	28.3	0.007	-46.1	99.9	19.07	999	99.99	29.26	7	587	0.00	999
89000	71	30.6	0.004	-45.8	99.9	18.22	999	99.99	27.93	6	588	0.00	999
90000	71	30.3	0.000	-46.2	99.9	17.42	999	99.99	26.73	6	587	0.00	999
91000	78	28.8	0.006	-46.8	99.9	16.64	999	99.99	25.61	6	586	0.00	999
92000	87	27.4	0.008	-46.3	99.9	15.90	999	99.99	24.43	5	587	0.00	999
93000	95	25.9	0.007	-46.8	99.9	15.20	999	99.99	23.39	5	586	0.00	999
94000	97	23.4	0.004	-46.1	99.9	14.52	999	99.99	22.28	5	587	0.00	999
95000	94	21.5	0.004	-45.4	99.9	13.88	999	99.99	21.23	5	588	0.00	999
96000	999	999.0	0.999	-45.3	99.9	13.26	999	99.99	20.28	5	588	0.00	999
97000	999	999.0	0.999	-44.9	99.9	12.68	999	99.99	19.35	4	589	0.00	999

TERMINATION 96472 GEOPFT 29405 GEOPM 12.6 MBS
TROPOPAUSE 48292 FEET 134.41 MB -75.0 C 99.9 C

MANDATORY LEVELS

GEOPFT	DIR	KTS	TEMP	DPT	PRESS	RH
631	73	7.0	21.6	16.3	1000.0	72
2083	84	6.0	17.1	14.5	950.0	85
3589	149	2.0	12.9	12.0	900.0	95
5161	303	10.0	11.7	-2.4	850.0	39
6819	290	20.0	9.7	-9.2	800.0	26
8569	283	24.0	7.0	3.5	750.0	78
10425	287	25.0	4.4	-1.4	700.0	66
12395	294	27.0	0.8	-2.2	650.0	80
14498	305	35.0	-1.8	-6.5	600.0	70
16758	306	47.0	-5.5	-13.5	550.0	53
19193	295	48.0	-9.1	-17.9	500.0	49
21845	289	50.0	-14.5	-27.1	450.0	33
24734	290	55.0	-20.3	-38.5	400.0	18
27929	290	62.0	-28.2	-44.8	350.0	18
31494	296	74.0	-36.1	-51.9	300.0	18
35556	303	92.0	-46.2	-61.5	250.0	16
40275	308	97.0	-59.5	99.9	200.0	999
42978	302	94.0	-65.6	99.9	175.0	999
46000	295	89.0	-71.1	99.9	150.0	999
49492	287	87.0	-75.0	99.9	125.0	999
53776	293	49.0	-74.7	99.9	100.0	999
58055	288	39.0	-68.1	99.9	80.0	999
60673	309	20.0	-70.8	99.9	70.0	999
63677	287	14.0	-68.7	99.9	60.0	999

67315	236	6.0	-62.5	99.9	50.0	999
71860	252	1.0	-60.2	99.9	40.0	999
77823	133	6.0	-55.5	99.9	30.0	999
81675	46	5.0	-52.3	99.9	25.0	999
86466	73	24.0	-46.6	99.9	20.0	999
92737	97	25.0	-46.6	99.9	15.0	999

SIGNIFICANT LEVELS

GEOMFT	DIR	KTS	TEMP	DPT	PRESS	IR	RH
16	20	3	17.3	15.0	1021.8	348	86
212	69	7	22.8	18.7	1014.8	358	78
603	73	7	21.7	16.4	1001.0	343	72
2261	87	5	16.5	14.5	944.1	326	88
2832	106	4	15.0	14.3	925.0	322	96
3219	131	3	13.7	12.9	912.3	314	95
3786	166	2	12.5	11.6	893.8	305	94
4362	290	2	11.2	10.5	875.3	298	95
4907	304	7	11.4	2.1	858.2	267	53
5437	303	12	12.0	-7.0	841.8	246	26
6564	293	19	10.0	-7.2	807.9	238	29
7195	287	21	9.4	-11.8	789.4	228	21
7779	284	23	7.7	0.6	772.6	244	61
8420	283	24	7.1	3.8	754.6	247	79
10239	287	25	4.7	-0.4	705.4	226	69
10850	288	25	3.8	-3.4	689.5	216	59
12122	292	27	1.3	-1.7	657.4	213	80
13309	299	30	-0.4	-3.6	628.5	202	79
15163	307	39	-2.8	-7.5	585.6	186	70
15775	308	42	-2.9	-14.5	572.1	174	40
16980	305	48	-5.9	-13.1	546.1	170	56
17577	303	48	-7.7	-13.2	533.6	168	64
18827	297	48	-8.3	-15.9	508.1	158	54
19419	294	48	-9.4	-18.8	496.5	154	46
20052	291	48	-9.9	-25.9	484.3	147	26
22524	290	51	-16.1	-26.8	438.8	136	39
23149	291	52	-17.8	-26.8	427.9	134	45
23838	290	53	-19.7	-29.1	416.1	131	43
25000	290	55	-20.4	-40.2	396.7	123	15
28194	290	63	-28.6	-45.0	347.2	111	19
29530	291	68	-32.0	-40.6	328.0	107	42
30150	293	71	-33.9	-40.6	319.4	105	50
31469	296	73	-35.8	-51.4	301.6	99	18
32212	298	76	-37.5	-54.4	291.9	96	15
33451	303	82	-41.2	-57.7	276.3	93	15
39694	308	97	-57.9	-70.6	207.0	75	18
44086	301	94	-68.5	99.9	166.8	63	999
47611	287	87	-74.1	99.9	139.3	54	999
48292	284	88	-75.0	99.9	134.4	53	999
51395	299	74	-72.4	99.9	114.4	44	999
54101	292	48	-74.8	99.9	99.4	39	999
54944	282	46	-75.6	99.9	95.2	37	999
57254	276	44	-73.7	99.9	84.4	33	999
57933	283	41	-68.5	99.9	81.5	31	999
61194	307	17	-71.2	99.9	69.1	27	999
67784	237	6	-62.3	99.9	49.6	18	999
76743	102	2	-57.3	99.9	32.2	12	999
87133	73	25	-46.2	99.9	19.8	7	999
97059	999	999	-44.9	99.9	12.6	4	999